4. Specification

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1 PRELIMINARIES

1.1 Introduction to the Project

Project Overview

The South Melbourne Market Roof address is York Street, South Melbourne, Victoria 3205.

The works within this contract are summarised as follows:

Construction of a new roof over the First Floor South Melbourne Market car park. A new rainwater harvesting and collection system. Works shall be conducted such that a minimum of 150 car bays (including 3 x accessible bays) remain available for public access and use during Market open days (Monday, Wednesday, Saturday and Sunday and some public holidays).

The contractor is to propose how many additional car bays can be made accessible during the construction period. The Contractor is to allow for traffic management of the site, including signage and revised parking layouts throughout the works in order to accommodate the above.

1.2 Interpretation

Definitions/Terminology

The headings of Specification clauses and sub-clauses are for convenience only and shall not change the meaning of the Specification.

The sequence of information and cross references, if any, are for convenience only and shall not change the meaning of the Specification.

Words implying persons shall, where applicable, to include companies. Words in the singular include the plural.

In any trade where the Specification calls for the Works to be carried out 'to the standards and requirements of the Local Authority', the Contractor shall allow for obtaining the details of such from the Local Authority and for complying therewith.

If works specified exceed the standard and requirements acceptable by the Local Authority, the Contractor shall allow to carry out the Works as specified.

Defined expressions in the Contract shall have the same meaning in the Specification, and the following expressions shall have the associated meanings:

Approved, approval:	Means obtaining approval from the Superintendent before commencing the applicable work. Such approvals are procedural approvals only. Any approval of drawings, samples, prototypes, workmanship, methods of work or any other matter whatsoever under the Contract or in respect of the Works does not waive or affect any right of the Principal or diminish in any way the Contractors responsibility in respect of the Works or

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	the Contract.
BCA:	Means the Building Code of Australia.
Codes:	Means, in addition to the Building Code, standard specifications or codes of practice published by Standards Australia and other recognised Australian and overseas associations.
Construction Validation:	The process by which the Contractor shall validate that all operational components of the building are commissioned and installed in accordance within the Contract documents.
Drawings:	Means Drawings issued by the Principal and/or Superintendent, including all subsequent details and amendments.
Handover:	Means handover of the Works by the Contractor to the Superintendent.
Including:	Means including but not limited to.
Inspected:	Means inspected by the Superintendent.
Make good:	The words 'make good' or 'to be made good' shall mean that the work referred to shall be reinstated to its original quality and/or new condition or to match the quality and nature of the surrounding finishes. All shall be to the satisfaction of the Superintendent.
Maintain:	Means maintained in working condition.
Month:	Means calendar month.
Proprietary:	Proprietary means identifiable by naming manufacturer, supplier, installer, trade name, brand name, catalogue and reference number.
Provide:	Means supply, deliver and install, and includes the meanings 'manufacture', 'finish' 'fabricate', 'test' and 'commission'
Reject, rejected:	Means rejected by the Superintendent as not complying with the Contract Documents and, unless the contrary is indicated, shall mean that the work or materials rejected shall be replaced or repaired by the Contractor at its own expense.
Required:	Means required by the Contract Documents, or by a statutory authority having jurisdiction over the works, or by law, or as required by site conditions to complete the work, or requested by the Superintendent.
Shop Drawings:	Means Drawings indicating complete details of fabrication assembly, installation and fixing of the items concerned, including explanatory notes and specifications.
Specification:	Means this document complete with attachments, annexures

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and appendices.

Statutory authority:	Means any statutory or other body, and its officers and agents, having control over all or part of the Works, or which supplies services to the Works.
Subcontractor:	Means any subcontractor, supplier, manufacturer, fabricator, installer or the like of the Contractor, or, if there is no subcontractor, the Contractor.
Submit:	Means submit to the Superintendent for approval, unless specified for information only.
Selected:	The words 'selected' shall mean selected by the Superintendent, irrespective of any trade usage and the Superintendent shall be the sole judge of what is or what is not selected. Selection is not restricted to standard range, but from all products available.
Visitors:	Means those persons invited by the Superintendent to view the Works on site.
Working Day:	As nominated in the relevant industry Working Day Calendar.

1.3 Documents

The Drawings and the specification represent generally the forms, dimensions and description of work to be carried out.

The Contractor is required to keep a copy of the Drawings and specification available on site for the duration of the Contract - all properly registered, maintained and up to date.

This specification and Drawings are not structured to suit separate trades (and Trade Contractors), but the document must be read in its entirety. Do not break up this specification to provide to trades. Parts of each trade appear in a number of sections, and all trades need to meet the requirements of the whole specification. No claims shall be made by the Contractor in relation to where information is provided in this specification

Drawing Schedule
The Drawings and schedules identified in the Document Transmittal for the tender documents apply to this Contract.

Classified Documents
Do not disclose to third parties Contract documents, except exclusively for the purposes of tendering, without the prior written approval of the Principal and subject to conditions imposed.

Provision of Drawings
Prior to the date of Possession of Site the Superintendent shall provide to the Contractor six sets of Drawings. Two sets of these Drawings shall be used for the preparation of the Building Contracts and the additional four copies are provided to the Contractor to execute the Works. The four copies from which to execute the Works shall be endorsed "FOR CONSTRUCTION" by the Superintendent.

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Should the Contractor require additional copies of these Drawings then they can be reproduced by the Contractor (solely for the purpose of the execution of the Works) or, they can be requested of the Superintendent.

Two copies of any revised Drawings will be provided to the Contractor with the relevant revisions noted. Revisions to these Drawings issued during the execution of the Works will also be provided on the same cost basis.

The Contractor will be provided with a drawing register at the date of Possession of Site. This drawing register will be supplied by the Superintendent and it should be maintained up-to-date for the duration of the Works by the Contractor. The Contractor must have an approved audit process for receipt of Drawings to ensure that the revised Drawings are reflected in the drawing register.

Should the Contractor request copies of the CAD files for the purposes defined elsewhere in this Specification then these will be prepared by the consultants. These will only be provided to the Contractor in an Autocad format. These CAD files shall be used for no other purpose other than those stated in this specification. The transfer conditions and the risks to the Contractor are also defined in this Clause of the Specification.

CAD Drawings
Unless specifically noted otherwise CAD Drawings will not be made available to the Contractor for the duration of the project. In the situation where CAD Drawings are provided to the Contractor they will be provided for information only and they shall not form part of the Contract Documents.
The Contractor shall note that CAD Drawings can be read to a much higher level of accuracy than can the paper (hard) copies of the Drawings. Do not read any dimensions from the CAD Drawings unless they are also evidenced on the hard copies.

The Contractor shall only utilise the paper (hard) copies to execute the Works. Any liability arising out of dimensions and information gained from the CAD files and Drawings which cannot be read or ascertained from the paper Drawings shall be the sole responsibility of the Contractor. The Contractor shall make no assumptions in relation to the CAD Drawings and have no expectations on their level of accuracy.

The purposes for which CAD Drawings may be made available to the Contractor are:

1. Architectural.
   For preparation of As-built Drawings

2. Engineering.
   For preparation of Engineering Services Shop and As-Built Drawings.

The issue of these CAD Drawings will be at the sole discretion of the Superintendent and the Contractor shall have no expectation that they shall be made available.

All of the Contract documents including any data transmitted during the construction of the works shall be considered copyright except for the sole purpose of providing information to the Contractor in undertaking works associated with these specifically nominated purposes.

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This information shall not be used for any other purposes or provided to any other subcontractors or to others without the permission of the Superintendent.

Upon transfer of this information to the Contractor and its successors and assigns the Contractor shall indemnify Paul Morgan Architects and the Principal from any liability arising from the transmitted data as a result of the information, of errors, omissions or incorrect information, corrupt data, incorrect operation of equipment and/or systems on which the data is used, infringement of intellectual property rights which may be the property of another party and/or any other cause.

The CAD Drawings are supplied on the following conditions:

(i) The Superintendent and the Principal assume no liability in connection with the supply or transfer of the data by electronic means or any use of it by the Contractor or any third parties that the Superintendent would not have incurred if the data had been transferred in the form of documents on paper.

(ii) Particularly, the Superintendent and the Principal do not warrant the integrity of the data or accuracy or quality of any information contained within the data and all responsibility relating to the use of such information is entirely the Contractor's.

(iii) The Superintendent and the Principal will not be liable for loss of profits, loss of use of data, software or information (or portions thereof) or any damage whatsoever suffered by you or for which you may become liable as a result of using the data.

(iv) The Contractor will perform all system back-up necessary to ensure that your system and all data files can be fully recovered in the event of error or corruption as a result of any data transfer.

(v) The Contractor will perform all reasonable virus and integrity checks on the data prior to the data transfer.

(vi) The Contractor will check and ensure that any system on to which the data is to be transferred (including any software and existing system data) is in good working order and is in a fit state to enable the data transfer to take place.

(vii) At or before the supply of the electronic data the Superintendent will give you a copy of the data transferred on paper. The Contractor may check and confirm that it is identical to the data provided electronically. The Superintendent shall be entitled to assume that the data provided on paper and electronically are identical unless you advise us of any discrepancies within seven days of the receipt of the data.

(viii) The data shall not be changed.

(ix) If a disclaimer is included in any part of the data, the disclaimer must be included in any reproduction of the part of the data to which it applies whether the reproduction is electronic or by some other means.

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(x) If the Superintendent's name and/or a copyright warning is included in any part of the data, it must be included in any reproduction of the part of the data to which it applies whether the reproduction is electronic or by some other means.

(xi) The Contractor will not provide the data or documents or information produced from the data to any third party without our prior written approval.

(xii) If the Superintendent approves the transfer of data to a third party the Contractor must enter a written agreement with them which is identical to this agreement except:

(xiii) for the names of the parties; and

(xiv) that equivalent points 1, 2, 3, 12 and 13 of this agreement must be for the Superintendent's benefit and the benefit of the Principal as well as for the Contractor's benefit.

(xv) It is possible that the Superintendent may provide the Contractor with later editions of the data from time to time. If the Superintendent does the Contractor must ensure that:

(xvi) any work undertaken by the Contractor is based on the latest edition of the data supplied; and

(xvii) any party to whom the Contractor have supplied data is promptly provided with the latest edition.

(xviii) In no event will the Contractor bring any claim or legal proceedings against the Superintendent, or the Principal, or the Superintendent's or the Principal's agents or employees relating to the supply of the data.

(xix) The Contractor shall indemnify the Superintendent and Principal and their respective employees and agents from and against any and all costs, expenses, fees (including reasonable legal and counsel's fees) and liability arising from the supply of the data.

Standards and Codes

The Contractor must comply with all requirements of the BCA and Australian Standards and Legislative Requirements current at the date of tendering, and Reference Codes and Standards listed in the preface to those Standards and Codes are applicable in respect of all materials and workmanship except where in conflict with the provisions of these specifications.

The applicable and relevant authorisation standards shall have the same force and effect and are made part of the Contract documents as if copied directly into the Contract.

Where materials and/or work which are the subject of an Australian Standards and specified without reference to the subject Standard, then the higher quality, standard or requirement for the materials and/or goods shall apply.

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Trade Names or Equal
Proprietary brands and trade names of materials or equipment must be used in accordance with the manufacturer's directions and with particular regard to the conditions relevant to these works.

All materials used for the Works must be as specified or scheduled. should the Contract documents state "or equivalent" or "or approved equivalent", then the following procedure shall apply:

Generally:
(i) The Superintendent or his representative is to be immediately notified prior to any such proposed change. The Contractor shall furnish all technical and design information to support the claim of "equivalence".

(ii) The Superintendent or his representative will be the sole judge the equivalence of the product.

(iii) The Contractor will provide written advice that acknowledges that they will bear all the expenses of the costs of test and other proofs of equality including assessment by a third party nominated by the Superintendent.

(iv) Where the Superintendent or his representative feels appearance is important, 'appearances' will be a factor in the judgement.

(v) Where the Superintendent or his representative approves the use of an equivalent product or material, the cost of supply and installation of the equivalent product or material will not be additional to the Contract sum.

Engineering Equipment:
The manufacturer and model numbers specified herein or on the Drawings indicate the preferred type of equipment and the design intent. Alternatives maybe proposed at the time of the tender where noted with proof that they are "equal". Acceptable "equal" proposal shall include submission of proof for:

(i) Identical construction details

(ii) Identical materials specification

(iii) Identical technical performance

(iv) Appropriate technical literature

(v) Any initial and running cost savings

(vi) Technical calculations

Where an item of equipment other than that specified or detailed in the drawing, which requires any redesign of the system, Drawings showing the layout of the equipment and such redesign as required therefore shall be prepared to the satisfaction of the Principal at the Contractor's own expense. Where such approved deviation necessitates a different quantity and arrangement of materials and equipment from that originally specified or indicated on the Drawings, additional materials and equipment required by the system shall be provided at no additional cost.

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Royalties and Patent Rights
All royalties and other sums payable and all licenses required for the use of any patented article, process or invention in or about the works shall be paid and obtained by the Contractor and the Contractor shall be liable for and shall indemnify the Principal against any legal liability, loss, claim, proceedings or costs whatsoever arising by reason of the Contractor infringing or being held to infringe any patent rights in relation to any such article, process or invention.

Interpretation of the Drawings

Diagrammatic Layouts
Layouts of service lines, plant and equipment as shown on the Drawings are diagrammatic only, except where figured dimensions are provided or calculable. Before commencing work the Contractor must obtain measurements and other necessary information.

Levels
Spot levels take precedence over contour lines and ground profile lines.

Dimensions
The Contractor must check dimensions on Site before proceeding with the work under the Contract. The Contractor must obtain measurements and other information necessary to carry out the work specified. If the Works include alterations and/or additions to existing work, the Contractor must verify the dimensions of the existing work before proceeding, and notify discrepancies to the Superintendent.

Do not scale Drawings.

Do not interpret / interpolate / read dimensions off any CAD Drawings.

Architectural Drawings take precedence over Consultant Drawings
Should there be discrepancies between drawings, the Contractor shall seek clarification from the Superintendent.

It shall be the responsibility of the Contractor to clarify and to refer to architectural Drawings and subsequent architectural advices for final placement of all services and the like in relation to joinery, fixtures and fittings.

No claim for a variation to the Contract Sum from a failure to do so will be considered.

1.4 The Site

Location
The site is located at: Corner of York and Cecil Streets, South Melbourne, Victoria.

Appreciation of Requirements
The Tenderer must visit and examine the site of the Works and become fully informed of its nature, surroundings, approaches and means of access, the location of existing utilities and services and all matters or circumstances likely to affect the cost or time for carrying out the Works.

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The Tenderer when inspecting the Site shall at their own cost contact the local authorities' officers in the area and check with them the location of all water, gas, electric, drainage, sewerage, telephone, fire alarm, control valves and all other services.

For the purposes of determining whether the Site Conditions differ from conditions or characteristics the Contractor should have reasonably anticipated, the Contractor shall be deemed to have, during the preparation of its tender submission:

- examined information made available to the Contractor by the Principal for the purposes of tendering, including without limitation the Contract Documents, Schedules, Conditions of Tendering, Reports, Maps, Diagrams, and the like;
- examined all information relevant to the risks, contingencies, and other circumstances which could affect the Works, and which is obtainable by the making of reasonable inquiries;
- informed itself as far as practicable of all relevant physical conditions upon and below the surface of the Site and adjacent to the Site, and the climatic conditions at or near the Site;
- informed itself as far as practicable of the nature of the Works and materials necessary for the execution of the Works, the means of access to and facilities at the Site, and transport facilities for deliveries to the Site;
- informed itself as to the availability of labour and the accommodation required;
- informed itself as to the existing services around the Site from relevant authorities;
- satisfied itself as to the correctness and sufficiency of the tender for the work under the Contract, and that the rates and prices stated cover the cost of performing all the Contractor's obligations under the Contract; and
- informed and satisfied itself of any other matter which may be reasonably necessary desirable or relevant to the submission of the tender;

Failure by the Contractor to do all or any of the things deemed to have been done under this Clause will not relieve the Contractor of his liability to perform all his obligations under the Contract.

No warranty is given by the Principal to the Contractor concerning the accuracy or otherwise of information regarding Site conditions supplied by the Principal. The Contractor acknowledges that it has not relied on any information supplied by the Principal regarding Site conditions.

Contractor's Site

The Contractor shall occupy only 50% of the Rooftop car park on market open days. The remaining 50% of the carpark shall remain open and accessible to the public on all market days for the duration of the contract (150 car spaces inclusive of 3x accessible carbays).

The boundary of the Rooftop car park construction zone may be amended from time to time as required for the staging of construction, however, the Contractor is required to co-ordinate with the Superintendent and Market Operator and agree on the extent of the Contractor's site prior to commencing. The minimum number of carbays to remain open

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(150 car spaces inclusive of 3x accessible carbays) is not negotiable during any of the Market opening days.
Market opening days are: Wednesdays, Fridays, Saturdays and Sundays throughout the year and some Public Holidays.

Contractor Site Extents:
The Contractor's Site for the execution of the Works is to be confirmed with the Superintendent prior to commencement of on-site works. Refer Appendix D. The Contractor's Site Extents include:

1.	Rooftop. Excluding 150 car spaces inclusive of 3x accessible carbays on market days)
2.	Street space above footpath (subject to council approval)
3.	Western Ground Floor Carpark – 13(no) car bays adjacent to market building

The use of the Site for temporary works and construction plant, including working and storage areas, location of offices, workshops, sheds and parking must be restricted to the site as described above and in Appendix D. The Principal cannot make available to the Contractor any other areas of land which are additional to the designated Site. Should the Contractor desire additional area and/or alternative access points to construct the Works and/or alternatively seeks to make use of the adjoining roads and footpaths, then it shall be the Contractors responsibility to negotiate access from the relevant owner or authority having jurisdiction over the land.

The Contractor must not permit any works to be performed outside the designated site boundaries including loading, carparking, storage and the like.

The Contractor shall prepare their tender on the requirement to execute the Works from within the area defined as the Contractor's Site Extents and to accommodate continuous use and public vehicle access to (150 car bays inclusive of 3 Accessible bays as a minimum (approximately 50%).

As part of the tender submission a proposed Site Control plan must be provided. Such plan will indicate:

- How the site is to be accessed during construction.
- The location of contractor's car parking and access arrangements.
- How impacts of the existing street network will be minimized during construction.
- Staging of construction in order to maintain the public vehicle access (minimum 150 rooftop car bays inclusive of 3 Accessible bays).

Prior to commencement of the development, a detailed Site Control Plan is to be submitted to the Superintendent for Approval.

Access Roads
The Contractor shall note the Contractors site as defined on the Drawings. Access to the Contractors site shall be via: York Street.

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The Contractor shall survey all existing roads, footpaths and kerbs in the vicinity of the Works and on the rooftop as described elsewhere in this Specification.

Contractor's vehicles shall not obstruct roads, driveways, escape routes from buildings and fire protection equipment.

The Contractor shall ensure that all trucks and cars leaving the site shall be thoroughly clean and do not allow the adjoining roads to be soiled. Clean all trucks as applicable prior to leaving site.

Existing Services

The Contractor must protect and maintain all public utilities and services installations on or off the site including gas, water, electricity, sewerage, stormwater, security, fire services, telephone and the like that may be disturbed during the execution of the Works.

All services on the site which are not required for the execution of the Works shall be shut off, capped or otherwise controlled, prior to commencement of the work under the Contract. In all cases each utility authority which is involved shall be notified in advance and its approval shall be obtained.

The Contractor shall identify all existing services affecting the Site and shall make all enquiries, surveys, inspections and tests necessary to identify and locate all services.

Unless reported to the contrary, the Contractor shall be deemed to accept that all existing engineering services are in good working order.

The Contractor must ensure that all services are maintained to any occupied and/or tenanted areas for the duration of the work. The electrical, mechanical, water, fire protection, security, fire, gas, telephone and the like shall continue to operate un-interrupted to the occupied and/or tenanted areas for the duration of the Contract.

Before interrupting any service such as electricity, water, gas, telephone and data, etc, the Contractor shall give at least 48 hours notice to the Superintendent describing the nature of the work to be done, the time and the expected duration of the shutdown. All interruptions shall be kept to the absolute minimum and only at such time as has been agreed to by the Principal.

Existing services may be used as temporary services for the performance of the Contract subject to the approval of the Superintendent. Should approval be granted to utilise existing services as temporary services for the performance of the Contract, the Contractor must pay for all costs in relation thereto.

The Contractor is responsible for the fire services for the duration of the Contract. The Principal will invoice the Contractor for any Metropolitan Fire Brigade false alarm charges arising from work by the Contractor or their Subcontractors.

During construction of the work and in the event of damage to any of the existing utilities and services the Contractor must render any assistance required in connection with any such instance. The Contractor shall be liable for the cost of any necessary repairs.

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Hoardings
The Contractor must secure the area designated as the Contractor's Site to meet their OH & S requirements and to the satisfaction of the Superintendent, and remove such modes of security upon completion of the Works and make good the grounds.

The Contractor must obtain the necessary consents for hoardings, pay all fees and charges, and construct hoardings in accordance with the requirements of the appropriate regulatory Authorities. The Contractor is responsible for obtaining all necessary scaffolding permits.

The Contractor must take all necessary precautions to minimise danger and obstruction to pedestrians. Precautions shall include supplying, installing and maintaining barriers and warning signs.

Occupied Premises
The scheduled buildings/areas are designated as an occupied premises and the Contractor must permit the occupants to continue in quiet, safe and secure occupation of the premises for the duration of the Works.

Occupied Premises Schedule:

1.	Approx 50% of rooftop on market open days(150 car spaces inclusive of 3x accessible carbays)
2.	Entire Market Floor and all market service areas
3.	All footpaths around the market on Cecil, Coventry and York Streets.
4.	Other areas to be agreed with the Market Operator .
5.	York St carparks
6.	West GF carpark excluding 13 bays

The Contractor must make available safe access to the Occupied Premises for the occupants and visitors and maintain all emergency egress routes in accordance with statutory requirements and safety issues. The Contractor shall allow for all screens, hoardings, signage and staging of the Works to ensure that the occupied areas remain in conformity with the safe egress requirements of the BCA.

The Contractor must arrange work to minimise nuisance to occupants and ensure their safety. Protect all occupants and visitors against weather, dust, dirt, water and other nuisance by temporary means which are safe and secure.

The Contractor must ensure that all services shall be maintained to the Occupied Premises for the duration of the project. Should the Works necessitate the temporary disconnection of services then the Contractor must allow for these works to be performed out of hours from the operational hours of the businesses and ensure their completion and reinstatement during the same period.

The Contractor shall take all steps necessary to minimise nuisance, disruption or anything that may affect the Occupant or their business. The Contractor and the Occupant will need to coordinate the Works as is most appropriate for the execution of the Works and the operation of their business in occupation. It shall be the Contractor's responsibility to ensure that these Works are coordinated and a staging plan for the Works specific to the environs of the Occupied Premises must be prepared. If necessary the scheduled scope

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of works shall be performed outside of working hours. The Contractor shall allow for this in the Contract sum.

Noise and Other Nuisance
The Contractor must take all practicable precautions to minimise noise resulting from its activities. All construction equipment shall be fitted with noise suppressors, acoustic linings or shields. All tools and silencers shall be kept in first class condition at all times.

Permission shall be obtained before carrying out work involving high level noise.

Comply with the recommendations set out in Appendix E of A.S. 2436-1981, Guide to Noise Control on Construction, Maintenance and Demolition Sites, and all Statutory Authority Regulations and Guidelines concerning noise and nuisance arising from the Contract being carried out.

The Contractor must comply with the Environment Protection Authority's Noise Control Guidelines for Construction and Demolition Site Noise and ensure that noise from operations does not cause a nuisance in Local Authority guidelines.

In all aspects, the Contractor shall take all reasonable precautions to minimise nuisance and disruption to the General Public and Occupiers of adjacent buildings in and around the building site and elsewhere. The contractor must promptly comply with all reasonable requests from such persons for the cessation of such nuisance including, but not be limited to, the following items:

- Limiting noise levels and vibration during the Works from tools, plant and operation.
- Respecting the rights and privacy of the building occupants, contents and general public.
- Not using radios, cassettes or devices capable of similar outputs to play music or other broadcasts.
- Not using offensive language within the hearing of building occupants, users or the general public; avoiding offensive behaviour such as wolf whistling.
- Sexual harassment and racial discrimination is illegal and regulations relative to such harassment will be enforced.
- Limiting offensive odours arising from the Works.
- Avoiding whenever possible the need for shouting in order to communicate.
- Provision and enforcement of suitable rules amongst the Contractor's staff and Subcontractors, suppliers of others working at the Contractor's instruction concerning the use of proper toilet facilities and the avoidance of spitting onsite.
- Consumption of alcohol and use of illegal substances whilst on the site is strictly prohibited.
- The avoidance of litter, trails of dirt and dust etc.
- Dogs are not permitted on the site.

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- Adjoining buildings, occupiers and the public shall be protected against dust, dirt and water nuisance. The Contractor will be responsible for and will be deemed to have made due allowance within his tenure.

- The Contractor must ensure that the behaviour of workers on the site does not offend the occupants of adjoining buildings and the public generally, and shall remove from the site anyone who's behaviour is unacceptable to the Superintendent.

Project Signboard
NOT USED

Site Offices and Amenities
a) Contractor's Office

The Contractor must provide service and maintain Site offices for the duration of the Works. The Contractor must keep the Site office clean. The position of the Site office shall be agreed with the Superintendent. If during the progress of the Works it becomes necessary to move the Site office, the Contractor may only do so with the approval of the Superintendent, without charge to the Principal and with the minimum of inconvenience. The Contractor must secure access to the Site office at all times.

The Superintendent must have access to the Site office while the Contractor is in attendance on site.

The Site office shall be ready for occupancy before any major site operations are started. Demolition or removal of the Site office on completion of the Works shall be carried out only with the permission of the Superintendent. The Site office shall remain the property of the Contractor and shall be removed from the Site on completion of the Works.

The Contractor's office shall be provided with a computer, software and data connection to email digital photographs from the site office to the Superintendent's office. The site office shall be equipped with a digital camera to record progress issues which may arise on site, for forwarding by email to the Superintendent's office. This facility must be provided on site within two weeks of possession of site. The foreman / or site representative must be familiar with and competent in the use of this equipment.

b) Telephone, Facsimile and Data

The Site office must be equipped with a telephone, facsimile machine, computer, modem and data connection which shall be available for use by the Superintendent and his delegated representatives, and maintained for the duration of the Contract.

c) Meeting Room

The Contractor must provide, in addition to the Site office and other amenities, a room suitable for use as a meeting room for all Site meetings. With the approval of the Principal Superintendent, rooms within an existing building on the Site (where applicable) may be used for the purpose of a Site office or a meeting room.

d) Site Amenities

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The Contractor will provide all statutory and necessary amenities and sanitary facilities as required for workmen and other persons lawfully upon the Site and remove them on completion of the Works. Any temporary amenities buildings to be provided shall be located in positions approved by the Superintendent.

The temporary sanitary conveniences must be kept in a clean and tidy condition for the duration of the Works.

Temporary Services
The Contractor must provide all temporary services necessary to complete the work. The Contractor shall provide, maintain and remove at Practical Completion all necessary services. These services shall include water, electricity, sanitary conveniences, plant and telephones and the like. The Contractor shall pay for all services until Practical Completion.

The Contractor must:

- Provide and maintain temporary services necessary for the execution of the work under the Contract, including temporary vehicular crossovers and temporary drainage and pumps;

- Install meters, valves and switchboards in accordance with the requirements of the relevant authorities;

- Pay all charges in connection with the installation and use of such services.

- Make all of the above services available to Subcontractors.

- Arrange temporary power, by making arrangements with the relevant authority to provide temporary power for duration of the Works to the standard in AS3012 (1990) 'Electrical Installations – Construction and Demolition Sites'.

- Provide adequate lighting for work in progress at any part of the Works to the level recommended in AS1680, and in accordance with the Code of Practice for Temporary Electrical Installation on Building and Construction Sites (Department of Business & Employment, Occupational Health and Safety Act 1985).

On completion, the Contractor must disconnect temporary services and clear away all traces of the installation and connections.

1.5 Site Safety

Safety/Security
The Contractor shall be wholly responsible for the proper and adequate safe guarding of the Works and of fixed and unfixed materials and equipment on the site during both working and non-working hours. The Contractor must take all necessary measures to protect the Works. The frequency of patrol inspections shall be as determined by the Contractor's Occupational Health and Safety Plan.

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The Contractor must at all times do everything prudent and/or necessary to ensure the safety and freedom from injury, damage or interference to all properties, services for persons in relation to the Works.

No claims for Extension of Time or Extra Cost will be allowed in respect of damage or loss of material or interruption of the work due to the Contractor's failure to safeguard the works. The Contractor shall without cost to the Principal replace all losses.

The Contractor must protect the public and adjoining buildings from any damage. All protection and precaution works must comply with all relevant Legislative Requirements.

Occupational Health and Safety
a) General

The Contractor is solely responsible for all issues relating to Occupational Health and Safety on the Site and for the Works. The Contract Documents fully describe the extent of the Works to be constructed, but it is the Contractor's responsibility as to how the Works are safely constructed on site.

Upon submission of the tender it shall be deemed that the Works described in the Contract Documents are able to be delivered in accordance with safe work practices. Upon submission of the tender the Contractor warrants that the Works can be constructed in a safe manner and in conformity with the scope defined in the Contract Documents.

During the tender period, the Contractor must familiarise themselves with the proposed Works to identify any part of the Works which cannot be constructed both in accordance with the Contract Documents and in accordance with Occupational Health and Safety requirements. The Contractor must nominate, at the time of tender, any portions of the Works which in their opinion they cannot construct safely and in accordance with OH&S requirements. If nothing is stated at the time of tender it shall be deemed that the Works can be constructed safely and in accordance with these requirements.

No claims shall be made by the Contractor to vary the Works in order to meet OH&S requirements during the Contract period. The Contractor must select their method of construction to achieve the best practices in work place safety. No claims shall be made in relation to time or cost resulting from any issue related to Occupational Health and Safety on the Site.

b) Legislative requirements.

Despite anything else contained in the Contract for the Works, the Contractor shall comply with the requirements of the Occupational Health and Safety Act, Regulations under the Act and those Codes and Draft Codes of practice and Regulations, including Plant regulations, which are relevant to work being executed under the Contract.

The Contractor must comply with the Occupational Health and Safety Act 2004 and is therefore obligated to provide and maintain, so far as is practicable, a working environment for its employees and members of the public, that is safe and without risk to health. As a condition of this Contract, the Principal requires that any Contractors or

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Subcontractors that may be engaged to perform a service or works on its behalf will at all times comply with the Occupational Health and Safety Act 2004 and provide and maintain a working environment, systems, procedures and practices necessary for the health and safety of all persons including Contractor employees, the Principal's employees and members of the public who may be affected by the services or works.

- As a condition of this Contract, the Contractor must identify all potential hazards and exercise all necessary precautions for the health, safety, and welfare of all persons it has engaged as employees or independent contractors or agents at all times to perform work at the Site. The Contractor will also identify all potential hazards and exercise all necessary precautions for the health, safety and welfare of the Principal's employees, visitors, persons in adjacent properties and members of the public who may be affected by the Works. This is to include those members of the public who, for any reason, enter the Works area and any buildings or compounds under the control of the Contractor.

The Contractor, its employees, Subcontractors and agents must comply with the following requirements in respect to health and safety:

- Legislative Requirements; codes of practice, Australian Standards, and the Principal's policies and procedures which are in any way applicable to the Contract or the performance of the services under this Contract;
- local, national or the Contractor's own standards or codes of practices, whichever are the most stringent, unless specified otherwise;
- requirements as necessary to ensure a safe system of work for the particular activity/location, including permit to work, isolation and lockout procedures and safety work practices;
- any specific requirements as directed by the Superintendent;
- control of all identified hazards associated with the system of work so far as it is practicable; and
- policies, procedures or measures implemented or adopted by the occupiers of any premises at or within which the Contractor performs work

c) Non Compliance

Where failure by the Contractor to ensure the safety, health and welfare of persons on the site results in civil or criminal liability on the part of the Principal, the Contractor shall indemnify and hold harmless the Principal for and in respect of any costs, expenses, penalties, fines, awards, damages, legal costs or compensation incurred by the Principal.

The Contractor must promptly, at its own cost, make provision to take measures directed by the Superintendent to comply with its Occupational Health and Safety obligations and the Contractors Health and Safety Plan. If the Contractor disputes the necessity to do so, it may refer the matter to the OH&S division of Victorian WorkCover Authority.

Pursuant to the Occupational Health and Safety Act 2004 and without prejudice to the responsibilities of all parties as set out in the General Conditions of Contract, the

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Superintendent may suspend whole or part of the Works until such time as the Contractor has complied with its Occupational Health and Safety Obligation. The suspension will be effective regardless of whether the Contractor disputes the necessity for the suspension. All costs arising out of such suspension will be borne by the Contractor.

d) Demonstrate evidence of OH&S Management System

The OH&S management system of the Contractor must meet the compliance requirements associated with all the duties of an employer and occupier specified in the Occupational Health and Safety Act 2004.

The Contractor must, when requested by the Principal, submit a copy of their Company's OH&S Management System. The Management System must include as a minimum requirement the following:

- OH&S policy and objectives;
- Organisation structure & responsibilities;
- Procedures for safe work practices including procedures for equipment and plant safety, dangerous goods and hazardous materials and public health, safety and welfare (if applicable) and first aid and emergency procedures;
- Training and induction programmes;
- Auditing and inspection procedures;
- Consultation procedures;
- Project Safety Plan;
- Project Risk and Plant Risk Assessment;
- Site Risk and Safety Plan;
- Performance monitoring;
- Reporting of accidents and injuries and potential hazards, accidents and injuries;
- Investigation of accidents and injuries and potential hazards, accidents and injuries.

e) Health and Safety Plan

The successful tenderer must prepare a site specific OH&S plan ('the OH&S Site Plan") prior to commencing the Contract works. The OH&S Site Plan must specifically address identified risks related to the works documenting the systems and methods the Contractor will implement to effectively manage those risks.

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Where possible the OH&S Site Plan should follow the existing company OH&S policy and procedures amended to address specific risks of the works. In addition, the OH&S Site Plan must also address the following issues:

- management and coordination of the Contractor's employees, independent contractors and agents to ensure health, safety, and welfare on the Contract works; and,

- provide for prompt notification to the Superintendent of any accident or injury or potential accident or injury occurring at the Contract works and an investigation procedure.

f) OH&S Reporting

The Contractor is required to provide regular fortnightly reports (at site meetings) on health and safety performance relating to the Works. An approved Occupational Health and Safety Checklist will be the basis of this report. The content of this form may need to be amended from time to time depending on the stage of the project and the specific works being performed by the Contractor. This report will be completed by the Contractor at regular intervals during the Contract work, at least monthly, or at shorter intervals if required.

g) OH&S Incident Notification

The Contractor is required to notify the Principal within 24 hours of any accident, injury, or potential accident or injury, property or environmental damage associated with the provision of the Contract works or services in accordance with the requirements of the Occupational Health and Safety Act 2004.

h) Non-compliance

The Principal has the right to suspend or terminate the Contract works if in the opinion of the Principal, the Contractor fails to remedy breaches of health and safety.

Contractor Site Safety Guidelines

a) Site Boundaries

Site boundaries shall be delineated according to the drawing in Appendix D and described as the "Contractor's Site". Such delineation must include all necessary hoardings, barricades, warning signs and/or lights, locked doors/gates, witches hats, total enclosure of the work site or other approved methods.

Work areas which are designated as restricted shall display notices in accordance with the applicable Australian Standards for warning signs.

The Drawings identify the overall site in which the Contractor may operate. The detailed extent of internal site boundaries are to be agreed with the Principal, Occupants and Superintendent prior to commencing.

During the term of the Contract, the Contractor must ensure adequate protection to adjoining property and their owners and occupiers. Where adjoining or neighbouring

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properties and/or buildings are damaged as a result of negligence, carelessness or inefficiency, the Contractor shall immediately repair such damage and make good surfaces without cost to the owners and occupiers of adjoining properties, or to the Principal.

b) Site Guidelines

When undertaking works the Contractor shall observe the following guidelines for operation:

- The Contractor shall be responsible for the safety standards for the site. On-site safety shall be maintained in accordance with the Occupational Health and Safety Act 2004, other relevant legislation and the best practices within the Industry.

- The Contractor shall erect all hoardings, screens, barriers, witches hats, hazardous lights as necessary to identify any hazardous or risks to the public, staff, or any other site occupants.

- The Contractor shall minimise dust and noise at all times.

- The Contractor shall advise of a detailed sequence of works.

- The Contractor shall not utilise any areas outside the Contractor's Area without approval of the Superintendent.

- Carparking, loading, storage and the like will not be permitted outside the Contractors Area.

- The Contractor shall appoint a designated safety officer to assist in the works outside the Contractors Area and where the safety of the employees or the public is at risk.

- The Contractor shall keep the Superintendent and the Principal's nominated representative fully informed of their sequence of works, their programme, their safety procedures and all works which effect the safety of the site.

c) Site Security

When the site is left unattended the Contractor must ensure that all points of entry to the site are locked and any other access prevented.

d) Electrical, Gas and Water Services

All electrical, gas, water, sewer, steam and other service lines not required in the demolition and construction process must be shut off, capped or otherwise controlled, prior to commencement of the work under the Contract. In each case any Utility Agency which is involved must be notified in advance and its approval or services, as necessary, shall be obtained.

e) First Aid

Prior to the commencement of the work under the Contract, the Contractor must make provisions for prompt medical attention in case of serious injury. On-site first aid facilities

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must be provided in accordance with the Occupational Health & Safety Act 2004 and the 2008 Compliance Code for First Aid in the Worksplace issued by Worksafe Victoria.

The telephone numbers of the hospital, physician, fire brigade or ambulances must be prominently posted on site. A first aider should be present at the site in accordance with the First Aid Compliance Code and a first aid facility and first aid kits complying with that Code must be available and accessible.

f) Housekeeping

Temporary electrical leads, hoses or pipes must be suitably supported and adequately protected in order to prevent injury to pedestrians and damage to vehicles.

Unless otherwise agreed, the Contractor shall be responsible for ensuring the restoration of the site to a condition that is free from risks to health and safety at the completion of the work under the Contract. All materials required on site must be stored safely within the site boundaries.

The Contractor shall be responsible for cleanliness, order and hygiene on site. On site amenities must comply with the standard of amenities in accordance with the Occupational Health & Safety Act 2004 and the Code of Practice for Building and Construction Workplaces issued by Worksafe Victoria.

g) Use of Work Platforms and Lifting Equipment

The Contractor must ensure that:

- safe work platforms are used where work cannot be performed safely from the ground or from solid construction.
- scaffolding is based on solid foundations.
- care is taken to prevent damage to scaffolding planks and components from falling debris.
- damaged planks and components are removed and replaced by qualified scaffolders.
- working platforms are kept clear of debris.
- damage to scaffolding from on site vehicles and earthmoving machinery is prevented.
- all scaffolding conforms to the *Code of Practice for Plant.*
- all scaffolding work, platforms, powered mobile plant, lifting plant, lift trucks and lifts conform to the *Occupational Health and Safety (Plant) Regulations 1999* and are the subject of risk assessment and risk control measures pursuant to those Regulations.
- so far as is practicable, no load is simultaneously lifted by more than one piece of plant, e.g. dual crane lift.
- so far as is practicable, no load be suspended over or travel over any person

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h) Ladders

The Contractor shall:

- inspect ladders prior to use to ensure that they are in good condition for safe operation.
- use ladders only for works of a minor nature.
- secure all ladders top and bottom.
- ensure that only one person works from a ladder.
- not over reach when using a ladder.
- not carry out any cutting or work involving the use of power tools from a ladder.
- use in accordance with manufacturer's recommendations

i) Roofs

The Contractor shall carry out all work on roofs in accordance with the Code of Practice - Work on Roofs.

j) Fire Protection

The Contractor shall be responsible for fire protection at the site.

Fire prevention must be taken into consideration when determining work methods and selecting tools and equipment for use at the site.

Fire alarms, fixed installations and ancillary equipment such as pumps and water supplies shall not be shut down or altered without the Superintendent's authorisation.

The cost of Fire Brigade call outs due to false alarms which are caused by the Contractor or are a result of the Contractor's Works will be a charge on the Contractor.

k) Electrical Safety

All electrical power tools, leads, site lighting and power supply shall be operated or connected in accordance with the Code of Practice for Temporary Electrical Installations on Building and Construction Sites. The Contractor must ensure that the provisions of the Occupational Health and Safety Regulations 2004 relating to electrical hazards from plant are complied with at all times.

l) Personal Protection Equipment

Personal protection equipment appropriate for the hazards associated with the work being carried out by the Contractor and subcontractor must be provided by the Contractor. The personal protection equipment must comply with statutory or Australian Standard specifications.

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The personal protection equipment required shall be listed on the approved Risk Assessment Checklist.

The Contractor is responsible for ensuring that the personal protection equipment provided to employees is used where required.

The Contractor must provide suitable storage facilities for personal protection equipment.

m) Excavation and Trenching

Any excavation and trenching work must be carried out in accordance with the provisions of the Code of Practice for Safety Precautions in Trenching Operations.

n) Containers That Have Held Combustibles

Welding and cutting work on containers that have held combustible solids, liquids, gases or dust must be rigorously cleaned by the Contractor to ensure that the containers are free of such material.

o) Contractor's Vehicles

Contractor's vehicles shall not obstruct roads, driveways, escape routes from buildings or fire protection equipment and all speed limits must be defined, clearly displayed and observed.

p) Confined Spaces

When work is to be performed inside a container, vessel or other confined space, work must be carried out in accordance with all applicable Codes of Practice and Australian Standards.

q) Dangerous Goods Act and Regulations Compliance

The Contractor must comply with the provisions of the Dangerous Goods Act 1985 and the Regulations made thereunder, namely:

- Dangerous Goods (Explosives) Regulations 2000
- Dangerous Goods (Liquefied Gases Transfer) Regulations 1987
- Dangerous Goods (Storage and Handling) Regulations 2000

r) Occupational Health and Safety (Plant) Regulations 2004

The Contractor must at all times ensure that the provisions of the Occupational Health and Safety (Plant) Regulations 2004 are complied with and in particular shall carry out risk assessments and control measures in accordance with, and as required by those Regulations.

s) No Smoking Policy

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No smoking shall be permitted in any of the existing buildings or the new buildings on site. This no smoking requirement also includes new buildings and refurbished buildings when they are under construction. Smoking on site will only be permitted in designated areas which are identified by the Contractor and only with the approval of the Contractor.

t) Alcohol and Drugs

The Contractor must ensure that its employees, Subcontractors and agents are not affected by alcohol or drugs when performing work or attending the site. Consumption of such substances in the course of carrying out the Contract is prohibited.

u) Personal Protection

Personal protection is to be provided according to the Occupational Health and Safety Act 2004. Personal hearing protection devices (complying with Australian Standard AS1270) must be used in all "Designated Noise Areas". Safety glasses or non-fogging goggles (AS 1337) must be worn when sawing, drilling, sanding, nailing, using any mechanical equipment or conducting work that could reasonably cause a hazard requiring protection. Head protection and 'site vests' for visual identification are to be provided for all staff at all times on site.

All personal protection is to be provided for all site visitors.

v) Disposal of Refuse

The Contractor must remove refuse (including food scraps and the like) resulting from work under the Contract from the Site.

The Contractor is responsible for the supply and removal of bins. Bins shall not restrict traffic in carriage ways and must be illuminated at night.

Debris must not be stored within stairways, passages or exits. All debris shall be removed from site and placed in bins. The Contractor is required to ensure that the work area is kept clean and tidy and that bins are emptied on a regular basis.

Bins and debris must be removed before holiday periods at Easter, Christmas and prior to Institute Open Days.

For dropping refuse, the Contractor must use hoppers and shutters, chutes or refuse buckets which are covered or of such a design as to confine the material completely and prevent dust emission.

w) Disposal of Contaminants

The Contractor must properly dispose of contaminants in accordance with all statutory and contractual requirements and from Site to approved locations or as otherwise directed by the Superintendent.

x) Installed Equipment

The Contractor must protect installed equipment against damage by dust, dirt, shock or other causes.

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y) Existing Flora

The Contractor must adequately protect from damage all trees, other plants and garden beds within or surrounding the Site. The Contractor is responsible for rectification of any damage to existing flora, including grassed areas and garden beds.

z) Construction Drainage

NOT USED

aa) Vermin Control

The site must be kept clean and suitable provision made for disposal of food scraps, etc. Take all precautions necessary to prevent infestation by vermin and insects.

bb) Synthetic Mineral Fibre Products

In any demolition or construction use of Synthetic Mineral Fibre products, the Contractor must ensure that work safe practices recommended by the manufacturers are complied with.

cc) Sexual Harassment

The Contractor must conform to the Equal Opportunity Act 2010.

1.6 Execution of the Works

Authority Approvals

Before entering into the Contract, the Principal has given notices, paid the fees, and obtained the permits, approvals and other authorisations stated in the following schedule.

This schedule identifies those applications made by the Principal and/or paid by the Principal. It shall be the Contractor's responsibility to obtain and pay for all other permits, approvals and authorisations necessary to complete the Works which are not identified in this schedule as being obtained or paid for by the Principal.

This schedule shall not be deemed to be a complete or fully inclusive list of the applications, permits, approvals and authorisations required by the Contractor, but only those applied for or paid by the Principal. The Contractor shall take all steps necessary to ascertain the permits, approvals and authorisations necessary to complete the Works and accept all risks and costs associated with Authority approvals.

Trade	Authority/ Service Provider	Application made by Principal (Yes/No)	Application to be made by Contractor (Yes/No)	Contribution/ Fees paid by Principal (Including GST)	Contribution/ Fees to be paid by Contractor (including GST)	Permits, Approvals, Authorisations received (Yes/No)
1. Building Permit	McKenzie Group	YES	No	100%	$	Pending
3. Town Planning Permit	COPP	YES	No	100%	$	Yes

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Obtain all necessary permits, consents, approvals and certificates from all authorities having jurisdiction over any part of the work of this Contract. Pay all royalties and costs relating to patent rights, trade marks or other protected rights. Comply with all regulations and by-laws of the authorities and fully indemnify the Principal against any claims arising there from.

Setting out the Works
The Contractor is responsible for the correct setting out of the Works and the accuracy of the Works, and shall make good at the Contractor's expense any errors which may occur. The Contractor shall employ and pay for the services of a licensed surveyor who shall carry out and check and provide the certificates required by the Superintendent.

The Contractor shall verify dimensions, bearings, levels and the existence of services.

The Contractor shall refer to the Superintendent for instructions in the case of any discrepancy between the Drawings and the physical features on site.

The Contractor shall coordinate and is fully responsible for the accurate and comprehensive setting out of the building including, but not limited to the following:

- existing columns and walls prior to the erection of any column or wall
- columns and beams between the lowest floor level and the upper most roof level and penetrations through them for services
- finish level of all floors
- walls, floor outlets and other services, including those in false ceiling spaces or cast into concrete elements
- the buildings and subsequent erection thereof in accordance with the documents within the boundaries of the site

The licensed surveyor must provide confirmation of the set out in the form of a survey plan when requested by the Superintendent. All costs associated with the engagement of a surveyor shall be met by the Contractor including any requests made by the Superintendent to confirm the whole or any parts of the set out of the works.

Statutory Requirements and Industrial Relations
General:
The Contractor must ensure continuity of cover for himself and his Subcontractor and shall, when called upon to do so, provide documentation to demonstrate that:

The Legislative Requirements of GST, Work Cover, Payroll Tax (where applicable) and Construction Industry Long Service Leave, PAYE Taxation, the Prescribed Payments Scheme and Redundancy Payment Central Fund are being met.

The provisions of Workers Superannuation schemes, where agreed between employees/unions and employers, are being met.

The Contractor must work strictly in accordance with the conditions of the Code of practice for the Building & Construction Industry – Victoria.

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Code of Practice:
Further the Contractor shall recognise the following Code of Practice and undertake to maintain a good industrial record and to ensure that the Contractor and all Subcontractors engaged by the Contractor will for the duration of the Contract:

(a) Adhere to awards and formal industrial agreements;

(b) Adhere to national Wage Case Principles;

(c) Prohibit 'all-in' or cash-in-hand payments;

(d) Ensure good safety practice in accordance with relevant legislation, awards and the procedures contained in the Building Industry Agreement;

(e) Refuse claims for payment for lost time due to industrial action unless: exceptional circumstances exist on genuine safety issues or fundamental breaches of Contract or employment by employers in accordance with the Building Industry Agreement. This remains the responsibility of the Contractor and is not to be reimbursed.

Other Requirements:
Contractors must comply with Equal Opportunity and Affirmative Action legislative requirements in the hiring and employment of staff as detailed in the current versions of the following Acts: Federal Racial Discrimination Act, Federal Sex Discrimination Act, Federal Disability Discrimination Act, Federal Human Rights and Equal Opportunity Commission Act, Federal Affirmative Action (Equal Employment Opportunity for Women) Act, Victorian Equal Opportunity Act.

Grounds on which discrimination may not occur include, but are not limited to: age, gender, pregnancy, race, disability (physical or intellectual, past, current or predicted), marital or parental status, religious or political beliefs, family responsibilities.

Contractors Supervision
The Contractor must provide an efficient and appropriate site organisation. In addition to a qualified and experienced General Foreman, the Contractor shall employ qualified Supervisors, Assistant Foremen, experienced Leading Hands and site office clerical staff as necessary for the execution of the work. Provide supervision of workmen and control of the quality of the workmanship.

The Contractor must provide a Services Coordinator. They must be employed full time on the site for the duration of the Works, and have role dedicated to the coordination of all building services.

The Contractor is responsible for ensuring that all operations and methods of the construction, material and workmanship, are safe, sufficient and in accordance with the Contract documents. No inspection by the Superintendent and no instruction given, or certificate issued by the Superintendent, shall be deemed to imply that the Superintendent has assumed or taken over any part of the Contractor's responsibilities.

The Contractor is responsible for the supervision of the Works to ensure that the Works are constructed in conformity with the Contract Drawings, specifications and other Contract Documents. The Contractor must oversee and supervise the construction of the

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Works and incorporate all standards set by the Australian Standards Association in relation to building practices and all regulations and by-laws of the relevant Authorities. The Contractor must supervise the day to day running of the building works and is responsible for the method of construction, its conformity with the documents, and the safe operation of the site.

Working Hours
Unless the Contract otherwise provides, the working hours are the customary industry working hours worked between 7:00am and 5:00pm, and the working days shall be Monday to Friday inclusive. Excluded are public holidays and where applicable rostered days off and scheduled productivity leisure days in accordance with the current Code of Practice for the Building & Construction Industry – Victoria.

NOTE: Work is permitted on Market open days provided that occupied premises remain uninterrupted.

The working hours and working days may be varied with the prior approval of the Superintendent when the Contractor finds it necessary to carry out work outside the working hours or on other than the working days stated in the Contract. In such cases the Contractor must promptly notify the Superintendent in writing and there shall be no charge to the Principal.

Clerk of Works
No Clerk of Works shall be appointed.

Quality Assurance
The Contractor shall establish and maintain a quality system in compliance with AS3900 or ISO 9000 series standards and shall be effective from the commencement of the Works. The Contractor shall provide details of the quality manual within 4 calendar weeks of acceptance of tender and if this is satisfactory to the Superintendent, the successful Contractor shall thereafter implement this system.

The Contractor shall not be relieved of any responsibilities or obligation in respect of the execution of the Works and shall remain solely responsible for the same notwithstanding:

- the obligations of the Contractor to plan, develop and implement a quality system in accordance with this Contract; or

- any comment or direction upon review or acceptance of approval to proceed with or request to vary any part of the quality system by the Superintendent.

a) Plan Outline

The plan outline is to be structured in accordance with the format detailed below and shall include the appropriate interfaces with the Contractor's own Corporate Quality System.

The tenderer shall submit a sample of the proposed plan for this Project. In addition, the tenderer shall submit a copy of its Inspection and Test Plan; its procedure for sample "Management Review" and "Document Control".

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b) Project Quality Plan

Subject to acceptance of the Plan outline by the Superintendent, the Contractor will be requested to provide prior to commencement and within fourteen (14) days of Letter of Acceptance a comprehensive Quality Plan based upon the approved outline document.

The Quality Plan must detail all measures to be undertaken and records proposed to accurately reflect full compliance with the project specification and other documentation.

c) Plan Format

As a minimum requirement, the Quality Plan shall detail the following:

1. Project Details, Name, Contractor, Client, etc
2. Scope of onsite/offsite works
3. Address the interface between client, consultant, principal contractor, subcontractors and suppliers.
4. Show organisational structure
5. Include job descriptions for key management and supervisory staff.
6. Detail level of responsibility and authority of all project staff.
7. Nominate a Project Quality Representative and provide appropriate CV for same.
8. Master List or similar control document procedure and specific registry of quality system and other technical documents.
9. Verification procedures for the completion of the works an identification of defects.

d) Cost and Time In Respect of Quality

The Contractor must allow for all verification/compliance testing of supplied goods and services in accordance with the various trade/discipline specifications, at no additional cost.

No additional costs will be paid for the provision of quality assurance measures necessary to reflect the requirements of AS 3902 as amplified by AS 3905.2 “Guide for the Use of AS 3901, 2 and 3 for Construction” on this project.

The Contractor shall be responsible for the performance of all its sub-contractors/suppliers to meet the quality assurance requirements of the Works.

If sub-contractors/suppliers employed on the project do not have the appropriate capacity to meet the quality assurance requirement the Contractor shall put in place appropriate quality systems for the sub-contractors/suppliers to demonstrate to the Superintendent that the required level of quality has been achieved.

e) Project Quality Records

The quality records to be maintained are those stated in AS 3905.2 Section 4. These records must be available on site at all times to the Superintendent.

Environmental Accreditation

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1.7 Administration

Programme of Work
Contract Commencement:

Construction Programme:

Within 7 working days after the letter of acceptance, establish a construction programme which demonstrates graphically the events, resources and times necessary to achieve Practical Completion on the last day of the time for Practical Completion as nominated in the Contract.

A construction programme for the whole of the works shall be prepared by the Contractor in critical path network form using Microsoft Project or approved equivalent with sub-networks as required to detail adequately the critical activities. Three A3 size copies of this construction programme shall be delivered to the Superintendent within three weeks of being given possession of the site. After approval of the Superintendent, the Contractor shall provide a data disk of the approved programme.

Indicate in the construction programme:-

(a) Completion times, in working days, for at least the following critical stages of the project:-

- Contract acceptance
- Possession Site
- Completion of set-out
- Completion of preliminary siteworks
- Completion of Safety Works
- Completion of checking by Building Surveyor
- Completion of commissioning and cleaning

(b) The earliest and latest starting and finishing times of all critical activities relevant to the Contract in diagrammatic form including any nominated sub-Contract and separate contracts. The critical path shall be highlighted in colour to indicate the critical events of the project commencing from the date of acceptance of tender and finishing at the expiration of the time for practical completion inserted in the Annexure to the General Conditions of Contract.

(c) In addition to activities on or near the critical path, significant activities would include:

- the work package carried out by subcontractors;
- the supply of any required Drawings or information by the Superintendent;
- approvals required from Authorities;

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- provision and approval of shop Drawings, samples or any other product data;
- any off-site activities such as prefabrication;
- supply of essential materials and major plant;
- commissioning, testing and coming into service of all installations;
- supply of draft and final operating and maintenance manuals and instructions;
- training and instruction of any operators;
- Contractor's verification process;
- supply of all as-built and installed information;
- Contractor's rectification of defects.

The programme shall clearly describe a critical path plan showing the dates of commencement and completion of each trade in each major section and items of the works and showing practical completion by the due date.

The Construction Programme shall provide details of the duration, interdependencies and occurrence of every significant activity necessary for the completion of the Works.

The allowable duration of each activity may vary with respect to the type of activity, its interdependencies and its significance. Activities of one week's duration on, or close to the critical path, are considered significant. The level of detail of non-critical activities must be such that the duration can be accurately assessed and the interdependencies clearly shown.

The construction programme shall be based on the relevant industry's work day calendar - a five day working week, excluding weekends, public holidays and leisure and rostered days off.

The work shall be executed in accordance with the construction programme submitted. The Contractor shall be entitled to advance the execution of the works and shall notify the Superintendent in writing of any change to the schedule.

At intervals of not more than 4 weeks and prior to the Site Meetings, the Contractor will review the whole of the Construction Programme and prepare a revised version of it which incorporates any changes in methods, times or sequence of activities and takes into account adjustments to the project calendar date, time, scale and provides for any agreed extensions of time. Every such revised version of the construction programme shall also indicate and provide for any corrective actions being or proposed to be taken by the Contractor to bring the progress of the Works into conformity with the requirements of the Contract relating to progress and completion.

Whenever the construction programme is revised, the Contractor will promptly issue to the Superintendent two A3 size copies of the revised version.

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Notwithstanding anything contained in this clause, the Contractor shall be and remain solely responsible for all planning, scheduling, sequences, methods, and techniques in and about the construction of the Works and for the due performance of all the Contractor's obligation under this Contract with respect to the progression and completion of the Works. In particular without affecting the generality of the foregoing, neither anything contained in the construction programme, nor the acceptance by the Superintendent of any version of the construction programme, nor anything else done or required by the Superintendent shall relieve the Contractor of his responsibility to procure that the Works are completed safely, on time and in accordance with the Contract documents.

The Contractor shall report at each site meeting the percentage progress on each current activity and identify the action proposed by him to overcome delays to any of these activities. The details so reported and identified shall be included in the minutes of the meeting. The Contractor must allow for the cost of providing and revising the programme within the tender as described herein.

Administration Procedures
The administration procedure for the issue of a Superintendent Instruction (SI) will be in accordance with the following:

- All instructions required under the Contract by the Superintendent or his representatives shall be issued on a Superintendents Instruction (SI) form and signed by the Superintendent or Superintendent's Representative.
- If an instruction involving engineering advice is required, the inspecting engineer shall provide Consultant Advice to the Superintendent. An SI will be issued to incorporate the requirements of the engineering advice and that advice will be attached to the Superintendents Instruction and forwarded to the Contractor. The Contractor must not undertake work from advice or instructions received directly from any Consultants. The Contractor must only undertake work from instructions received from the Superintendent.
- Where the Superintendent determines that a Cost Variation is likely due to the issue of an SI, they will provide clear instruction to proceed or not to proceed with the work. The Contractor must proceed with the work when instructed, notwithstanding that the cost of the variation is yet to be determined.
- The Contractor will price the SI and return a Variation Quotation with a detailed and comprehensive break up of cost to the Superintendent. This must be provided prior to the date nominated on the Superintendent's Instruction. Compliance with these dates may be a condition precedent to the payment of Progress Certificates at the sole discretion of the Superintendent.
- The Superintendent will review, assess and issue a Variation Order to the Contractor to formally determine the value of the variation and the Contract Sum Adjustment.
- Variation Orders will be numbered sequentially regardless of the origin of the Variation.
- Where a Quantity Surveyor is appointed they shall consult with the Superintendent to prepare estimates and review claims for Variations and seek assistance from the Engineers as necessary.

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- The Construction Drawings issued to the Contractor will not be updated to include variations to the Works instructed by the Superintendent. The Site Instruction and any associated sketches/Drawings will be the full extent of information and Drawings issued to Site. The Contractor must maintain a QA procedure to ensure compliance with all Site Instructions as they amend the Construction Documents.

Cashflow Forecast
The Contractor must provide to the Superintendent (within seven working days of acceptance of tender) a cashflow forecast showing the monthly values of work expected to be completed in relation to the Contract time. This forecast must be based upon and consistent with the construction programme and is submitted in accordance with the Programme of Work.

With each Progress Claim submission by the Contractor they must include an updated copy of the cashflow forecast to reflect the actual figures in addition to the forecast figures.

Site Meetings
The Contractor must hold, facilitate and chair site meetings throughout the term of the Contract and ensure the attendance of the Superintendent and Consultant representatives. A representative of the Principal may attend from time to time.

Site meetings will be held at intervals not exceeding 2 weeks at an agreed time. The Contractor must keep complete and accurate minutes of site meetings and within three working days after each site meeting, submit to each party written copies of the minutes for their action.

The site meetings shall provide the forum in which the progress of the Works can be monitored, the principal design and construction issues can be addressed, and to ensure that administration related procedures are being dealt with in a timely manner. The site meetings provide the overview of the project and shall be chaired by the Contractor to achieve this objective.

Prior to the commencement of the Works the Contractor shall attend a preliminary site meeting, arranged by the Superintendent, with the Principal, Project Manager, consultants and other relevant stakeholders. The objective of this meeting is to discuss and/or confirm site management issues and details of Contract Administration procedures.

Progress Certificates and Payments
Invoices are processed as described in the General Conditions of Contract AS4000 and the Annexure. The Contractor is required to present a GST Invoice and Statutory Declaration. Invoices cannot be processed without these details.

The Contractor shall furnish, in an acceptable form to the Superintendent, statement of the amount claimed for each Progress Payment. The claims are to be fully itemised and shall show the value and percentage of works carried out to date for each trade heading. The Superintendent will issue Progress Payment Certificates at monthly intervals in accordance with the Terms of the General Conditions of Contract.

Provisional Sums and supplied items included in the Tender Documents will be omitted in full or in part at the Superintendent's discretion, in ascertaining the Contractor's works value for Progress Payment purposes.

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The Contractor shall note that all warranties and guarantees must be produced in writing at the completion of each relevant trade before Progress Payments are authorised.

As a condition precedent to the payment of each Progress Certificate, the Contractor must provide Variation Quotations to the satisfaction of the Superintendent.

The Works include all administrative procedures required to perform the work in accordance with the Contract documents. When assessing progress claims the Superintendent must take into consideration the Contractor's progress in relation to the pricing of variations. Failure to comply with the pricing of variations by the date nominated on the Superintendent's Instructions may result in the withholding of a Progress Certificate. The Superintendent, at their sole discretion, may elect not to process a Progress Certificate until they are satisfied that the required Variation Quotations have been satisfactorily provided.

The Variation Quotations must include comprehensive and detailed costings together with all supporting documentation required for the Superintendent to determine a value for the variation.

It is the Contractor's responsibility to ensure that the Variation Quotations are provided by the nominated dates. No time extensions will be granted for any issue in relation to the delay in providing a Progress Certificate due to the failure to comply with these requirements.

Practical Completion

Practical Completion is the stage in the execution of the works under the Contract when the works are complete except for minor omissions and minor defects which do not prevent the works from being reasonably capable of being used for their stated purpose, which the Superintendent determines the Contractor has reasonable ground for not promptly rectifying, and rectification of which will not prejudice the convenient use of the works. This shall include those tests which are required by the Contractor be carried out and passed before the works reach Practical Completion, have been carried out and passed, and documents and other information required under the Contract which, in the opinion of the Superintendent, are essential for the use, operation and maintenance of the work, which have been supplied.

The Contractor shall have completed the Works (save for minor omissions and minor defects) including the following items before the issuance of a Certificate of Practical Completion:

(Generally in chronological order)

- completion of the Works (including site clean up to the satisfaction of the Superintendent)
- Construction Validation by Contractor
- Contractor's Defects Rectification
- provision of as-built Drawings and Operation & Maintenance manuals.
- lodge all documents including warranties and guarantees, maintenance manuals and approvals from all relevant authorities.

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- provide a Certificate of Final Inspection as issued by the nominated Building Surveyor
- commissioning
- provision of training for Principal's Staff (the Contractor must make reasonable endeavors to co-ordinate times for staff training).
- Coordinate Superintendent's/Consultants' Defects Inspection
- Rectification of all defects which the Superintendent determines may prejudice the convenient use, or safety of, the Works

All items listed as defects shall be completed within 15 working days from the issue of the defects list.

If such minor items are not completed within the 15 working days the Superintendent shall have the right to engage tradesmen and execute the completion of the items and shall be entitled to charge the Contractor for the expense in respect of same. These changes shall include the consultant fees associated with having these works performed by another contractor.

The Works, including Operation and Maintenance Manuals, must be complete before Practical Completion. The Superintendent will not issue a Certificate of Practical Completion where there is outstanding work or where the Works are incomplete.

Variations

a) Final

Within one month of the issue of the Certificate for Practical Completion the Contractor must conclude their claims for variation costs. Variation costs which arise after this time will not be accepted by the Superintendent and this requires the Contractor to remain up-to-date with the costings of variations throughout the duration of the project. The Contractor must take all steps necessary to ensure that they, and any of their subcontractors or suppliers, are aware of this requirement and they shall notify them of this closing date of the submission of Variation Claims and Costs.

Provisional Sums and Quantities
Please provide provisional quantities for the following items included in the tender:

Render:	Remove and replace render (in areas less than 0.5m2) 10 no. Remove and replace render (in areas greater than 0.5m2) 20m2
Concrete repair:	Repair concrete as specified (in areas less than 0.5m2) 10 No. Repair concrete as specified (in areas greater than 0.5m2) 20m2

Amounts for profit and attendance are to be included within the tender for these provisional quantities. Work extending beyond the Provisional Quantities will be charged at these rates with additional percentage for profit and attendance as defined in the Annexure.

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Contingency Sum
No contingency sum is included in this Contract. ($Nil).

Separate Contracts
NOT USED

Out-of-Hours Contacts
The Contractor must respond (and be in attendance) to any request by the Principal or their nominated representatives to attend to emergency situations on Site, outside the normal working hours.

Within 7 days of letter of acceptance, the Contractor must provide the names and contact telephone numbers of responsible persons employed on the Site who may be contacted after hours during the course of the Contract.

Form of Security

For the purposes of this Contract, the security shall be Bank Guarantees in a form approved by the Principal. Separate Bank Guarantees must be provided for each amount of the retention fund to be released at separate stages in the Contract. The Bank Guarantees shall be released at the dates of Practical Completion and Final Completion.

The Superintendent may, at their sole discretion, require additional monies retained to ensure the completion of the defects and the provision of the Operation and Maintenance Manuals. These monies shall be withheld from payment to the Contractor until the Operation and Maintenance Manuals are provided and all the defects identified by the Superintendent at the time of Practical Completion are rectified by the Contractor. Where defects have not been rectified within 15 working days, the Superintendent will arrange for others to rectify the defect(s). The cost of these works shall be deducted from monies owed to the Contractor – directly from the cash retention or, where required, from the Bank Guarantee. Any outstanding cash retention will be returned to the Contractor subsequent to the satisfactory completion of the defects by others.

GST
Goods and Services Tax (GST) applies to the Works. The Works will be valued nett and the GST will be added to the nett assessment.

1.8 Reports/Audits

Hazardous Materials
(a) Generally

All materials, articles or substances brought onto the Site by the Contractor which pose any health, fire or explosion risks, must be used in accordance with all current regulations and manufacturer's recommendations and full details must be presented to the Superintendent in the form of a Hazardous Materials Register. The Contractor is responsible for the supply of information and training of all labour, on materials or substances which are brought onto the Site. This information may be requested by the Principal through the Superintendent.

The Contractor shall provide safe storage, handling and labelling of all hazardous material in accordance with the Dangerous Goods Regulations. This includes segregation of

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chemical classes, the provision of bunding, physical security and the issue of MSDS's prior to use. Adequate measures are to be taken to contain potential spillage, including the on-site availability of materials to contain and clean up spills.

The Contractor is responsible to clean up and to make good any damage (both direct and consequential) resulting from leaks and spills.

The stormwater drains are not to be used for the disposal of hazardous waste. The Contractor shall store and dispose of hazardous waste in accordance with all Standards and Authority requirements.

Refer Appendix E Part 5 Asbestos Audit Review. In the event that hazardous materials are discovered on site, the contractor should exercise caution, comply with all work safety guidelines and advise the Superintendant immediately.

1.9 GENERAL

Treasure Trove
Any treasure trove, including coins or objects of antiquity found during excavations or attendant work shall remain the property of the Principal and must be handed to the Principal immediately they are found. Refer General Conditions of AS4000 Contract, Clause 24 Site.

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2 GENERAL BUILDING REQUIREMENTS

2.1 Submissions

Samples
The Contractor shall provide samples and sample panels for approval by the Superintendent prior to commencing the work for which the sample is provided.

These samples are required for the Superintendent to make a penultimate assessment of the proposed material and/or finish and/or colour.

Provision of the nominated sample does not mean that the finish or sample will be automatically approved. The sample, finish or sample panel will be resubmitted as many times are necessary to gain approval from the Superintendent in relation to quality, colour, finish, detail and suitability for its intended purpose.

The Contractor must allow in their tender sum and their programme for the Superintendent to vary the colour of the sample submitted at least once subsequent to the originally requested sample being provided.

For all other assessment criteria other than colour the Contractor must allow for as many samples as maybe required to gain the approval of the Superintendent. This requirement must be allowed for in the tender sum and programme for the Works.

A sample register must be established (to the satisfaction of the Superintendent) by the Contractor to allow the Principal and Consultant team to record acceptance of the sample.

Prior to commencing the trade, the Contractor shall submit the following samples for the project at the size nominated:

Item	Colour/Size/Number
a. Concrete • N/a	
b. Masonry • N/a	
c. Structural Steelwork • N/a	
d. Metalwork • N/a	
e. Carpenter • N/a	
f. Joiner • N/a	
g. Plasterer/Render •	
h. Roofer • **Colourbond Roof sheet (RF-01)**	

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• **Opal Roof sheet (RF-02)**	
i. Façade, Window Frames and Glazing • N/a	
j. Floor, Paving and Unit Finishes • N/a	
k. Doors, Door Frames and Hardware • N/a	

Samples must not be incorporated in the Works, but shall be provided separately for continued reference against the item under construction. The provision of all samples must be programmed by the Contractor to gain approval from the Superintendent prior to any potential delay arising from the request for further samples, unsatisfactory execution of the sample or review by the Superintendent. Time extensions shall not be granted for the approval processes associated with the provision of samples.

The Contractor shall identify the project subcontractor or supplier, manufacturer and applicable product and model numbers attached to the samples. The Contractor shall identify all non-compliances with the project requirements, and the characteristics which may detrimental to successful performance of the completed work.

The Contractor shall keep approved samples in good condition on site for reference until Practical Completion.

The Contractor shall only commence items of the works for which those samples have been approved by the Superintendent, the Principal and members of the consultant team as nominated by the Superintendent.

The Contractor shall coordinate the submissions of all related samples. Any delays caused by the late submission or inadequacy of samples shall not be recognised as a reason for a variation or time extension.

It shall be the Contractor's responsibility to match approved samples throughout the work.

2.2 Prototypes

The Contractor shall provide prototypes for the items nominated below. The reason for these prototypes being requested from the Contractor is to allow the Consultant team to confirm that the nominated component of the Works can be constructed as detailed are tested and are suitable for their intended purpose. The Contractor is responsible for fabrication of the prototype, which confirms the setouts, the materials, the detailing, the tolerances, issues of constructability, and fitness-for-purpose.

These prototypes must be provided and constructed in a time period where they do not cause delays to critical path activities. Therefore, the Contractor shall construct these prototypes as early as possible for consultation /revision with the Superintendent.

Construction of the prototype does not mean that it will gain approval from the Superintendent. The fabrication/approval of a prototype is a process which requires Contractor involvement. It requires the Contractor and the Superintendent to collectively review the prototype to make minor additions, design suggestions and/or alterations to the

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prototype from time to time to meet with the design and construction objectives of the component under consideration. The Contractor must allow for minor modifications to the prototype which arise from the Superintendent/Contractor review. All of this work shall be included in the tender sum.

The components for which the Superintendent requires the Contractor to provide a prototype are:

- Flashing profiles – capping and fascias
- 1x downpipe clip.

2.3 Shop Drawings

Four copies of each set of shop drawings shall be submitted. These shall be collated and stapled.

The drawings shall be comprehensive indicating all details of fabrication, assembly installation furnishing and fixing of the items concerned for the following:

Scaffolding / Access walkways / steelwork / ladders / roof access systems / Syphonic Roof Drainage System

Submit computations to demonstrate structural sufficiency, safety and performance.

Setout:

Detailed setout of the work. including centrelines or reference points, joint widths and spacings, edge margins, anchorages and fixings, ancillary and adjacent work, in plan, elevation and section. Include templates as required.

- Fabrication and construction details:
  Large scale details of members and assemblies, including structural properties and specifications of materials. Include three-dimensional and exploded views if requested.

- Assembly, installation and connections:
  - Fabrication, installation, and allowable range of base-structure movements.
  - Embedments, anchorages, brackets and attachments to base-structure.
  - Separate identification of dead load and restraint connections where applicable.
  - Connections and fixings, including visible fixings and sealing.
  - Closing off, sealing and trimming to base-structure and adjoining surfaces.
  - Provision for movement, and three dimensional adjustment.
  - Provision for construction tolerances.

- Indicate sequence of installation, including method of installing the last panel in any vertical section so that required joint movement allowances are maintained. Indicate method of verifying provision for movement after installation.

- Flashings/Trims

- Hardware, fittings, trim and accessories

Joints

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- Finishes, colours and coatings
- Performance requirements
- Cores, chases, built-in fixings and the like

Coordination of shop drawings with other trades

The Contractor must submit the drawings after having checked and coordinated them with all other trades and the Contract Documents.

The Contractor shall submit them in complete trade lots for each of the above. The drawings must not be submitted staged, in part or incomplete. The drawings shall be returned to the Contractor if they are not in a satisfactory form for examination by the Superintendent. Shop Drawings must be submitted in an approved form to the Superintendent a minimum of 4 weeks prior to manufacture. Should the drawings require amendment, the Contractor shall amend the drawings as required by the Superintendent. The Superintendent must be given 2 weeks to check the Shop Drawings. If returned to the Contractor for amendment, the Superintendent shall be given a further 2 weeks to examine the amended shop drawings. The Contractor shall make due allowance in the programme for this examination process of shop drawings prior to manufacturing.

The Contractor must acknowledge that there will be regular exchange of information between the Superintendent/Consultant team and Contractor/Shop Drawing team to prepare shop drawings. Discrepancies which become evident shall not entitle the Contractor to an Extension of Time. The Contractor must recognise this process of clarification, provision of information, identification and resolution of discrepancies as part of the Shop Drawing procedures and shall be deemed to be included in their Tender Sum and Project Programme.

Prior to submission to the Superintendent, the Contractor shall be required to check, approve and sign the submitted shop drawings. The Contractor shall not forward any shop drawings to the Superintendent directly from the Subcontractors. The drawings shall be checked for dimensional accuracy, number, extent, compliance with standards, coordination with all other services and to ensure all necessary ceiling heights are maintained. The Contractor shall also identify any foreseeable problems or conflicts.

The Contractor shall be responsible for coordinating the services within the ceiling spaces nominated.

Prior to shop drawings for the Mechanical Services being submitted to the Superintendent for examination the Contractor shall check and coordinate all other services with the mechanical layouts. The Contractor shall ensure there is no conflict of services and that the required service zones and pathways are maintained.

2.4 As Built Drawings

The Contractor shall provide within 2 weeks prior to the date of Practical Completion of the Works three sets of prints of the final as-built drawings and an electronic transfer of information in an approved form. The drawings shall include locations of all installed services and roof access systems, including mechanical, electrical, communications, security, sprinklers, hydraulics, fire services, stormwater, sewer, gas etc. Failure to

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provide these drawings will result in the Superintendent withholding 2.5% of the relevant trade claim owed to the Contractor until they are satisfactorily completed.

The Contractor shall obtain from the Superintendent a computer disk of the relevant drawings (only for the purposes of providing as-built drawings) and shall mark thereon the exact position and route of all underground and concealed piping and/or ductwork and wiring as actually laid, by dimensions from boundaries, buildings and other fixed points.

The position of all valves, branches, inspection openings, etc., shall be dimensioned and shall be checked by the Contractor before the work is covered up.

Variations in position or size of pipes, valves, etc., within the building shall be marked on these sets of drawings and checked by the Contractor.

These dimensioned drawings shall be returned to the Superintendent on completion to enable an exact record of the whole installation to be made for use in future maintenance.

It is the Contractors responsibility to prepare all of the as built drawings on an electronic format.

The Contractor shall coordinate and show all dimensions where applicable. Supply all notes and descriptions necessary for a complete record including variation referencing.

The Contractor shall supply drawings showing services or installations as completed, and such services shall be correctly drawn, dimensioned and clearly indicated including all relative inverts and levels, valves, stop clocks, changes in direction, points of access, junction fittings, sizes, flow capacity and other relevant information.
Generally installation and service drawings shall be executed at the time of construction or installation and before the items have been covered up. The Contractor shall:

- During the installation of all services maintain a check and recording system for the exact location, size, materials and levels of such services;
- Keep an accurate record of the works as build on dye trace copies of all relevant drawings and arrange with the Superintendent for obtaining CAD transfer or dye tracings from an approved commercial printing company and pay all costs;
- Employ only competent draftsmen to carry out the recording legibly with suitable dimensions and labels in accordance with AS 1203 show levels of in ground services and dimension to columns or fixed parts of the works.

These drawings shall form the basis for recording the final actual locations of all services and other alterations and in particular as follows:

- Water supply (including cocks, ties, branches, valves etc.)
- Stormwater (including pits, 1.0's, inverts, etc.)
- Sewerage (including pits, 1.0's inverts, etc.)
- Fire Service (including control valves, etc.)
- Underground Electrical Supply Cables.
- Conduits cast into slabs.

For services installations to be concealed below ground or in-walls the Contractor must photograph the installation prior to concealing the works. Provide copies of photographs with as built drawings.

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2.5 Site Records

The Contractor shall make legible daily records for the site which shall be made available to the Superintendent upon request. These daily records shall include (but are not necessarily limited to the following):

- labour on the site
- construction plant on the site
- materials on the site
- classification of tradesmen and staff employed on the site
- visitors to the site including those from the Contractor's head office identifying arrival and departure times
- daily weather record
- inspections and test undertaken
- all issues in relation to the Occupational Health and Safety Guidelines including all accidents or near accidents
- tests and attendance by authorities having jurisdiction over the works
- meetings of contractor's, consultants and other project stakeholders on site
- industrial disputes
- notifications from any party not directly associated with the work (adjoining properties, tenants, public and the like)
- QA procedures
- OHS procedures and records
- The Contractor and/or their subcontractors and/or their employees, as the situation requires, must provide sworn affidavits in relation to activities, work, communications, information and like, when requested by the Superintendent. The Superintendent may request evidence in the form of an affidavit to clarify matters of site records.
- Record of all incidents, complaints, discussions or agreements with the building management/operators.

2.6 Surveyor Confirmation

The Contractor shall engage the services of a licensed surveyor for the setting out of the Works. The Contractor's surveyor must provide confirmation to the Superintendent that the setout for the Works are in accordance with the Contract Drawings at the following stages of construction:

- Preliminary setout for the in-ceiling works including roof framing, structural members, access and rigging platforms.
- The survey confirmation shall be undertaken prior to any fabrication.

The survey drawing must show any deviations from the structural setout as confirmation to the Superintendent that the Works are being executed in accordance with the Contract Document. Errors in the setout shall be corrected by the Contractor at no cost to the Principal.

The confirmation of the building setout is to be provided to the Superintendent as verification of compliance with the Contract Documents and does not diminish the Contractor's responsibility for the accurate setting out of the Works. The Contractor must undertake all other survey work as necessary to meet their responsibilities under the building contract.

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2.7 Operation and Maintenance Manuals

Before the date of Practical Completion, the Contractor must furnish to the Superintendent three copies of operating, service and maintenance instructions or manuals for items of equipment and plant, including supplier's or manufacturer's descriptive literature, all as further described in these Specifications. Include a complete list of suppliers of all equipment and major materials used in the Works. Failure to provide the comprehensive Operation and Maintenance manuals will result in the Superintendent withholding 2.5% of the relevant trade claim owed to the contractor until they are satisfactorily provided.

Unless otherwise specified the manuals shall include

- On completion submit a maintenance manual setting out a program for regular maintenance cycles at not more than five-year intervals. Include renderwork cleaning, desalination, inspection and repair of joints and flashings, checking rainwater goods for blockages and breakdown, and detection of potential failures arising from movement or other causes.
- Comprehensive manufacturers information on all plant and equipment installed
- The designed performance specifications and commissioning test results
- All services, wiring and assembly diagrams for all plant and equipment
- Details of all manufacturers maintenance instructions.
- Information required for arranging both servicing and spare parts.
- The names and contact details of any subcontractors who installed each piece of plant and equipment.
- An A3 paper copy of all "As built Drawings"

Schedules:

- All schedules described in Consultants Specifications.
- Mechanical installation/equipment and lifts service/equipment
- Electrical installation/equipment/fire services/communications
- Proprietary equipment items (including spares identification, etc)

Specific requirements relating to the provision of Operating and Maintenance Manuals and plant operation training sessions are further defined in the respective engineering services sections of this Specification.

The manuals are to be submitted in draft for review prior to final documentation.

The Contractor shall allow three (3) working days for comprehensive education and training of the nominated Principal's personnel in the use and operation of all installed plant and systems, including engineering services installation.

Subcontractors will be required to furnish to the Contractor all instructions, manuals and other literature in accordance with the requirements of their respective subcontractors.

Format: A4 Size loose leaf, in commercial quality, 4 ring binders with hard covers, each indexed, divided and titled. Include the following features:

- Cover: Identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL" to spine. Identify title of project, volume number, volume subject matter, and date of issue.

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- Ring size: 50 mm maximum, with compressor bars.
- Text: Manufacturers; printed data, including associated diagrams, or typewritten, single-sided on bond paper, in clear concise English. Number pages consecutively.
- Dividers: Durable divider for each separate element, with typed description of system and major equipment components. Clearly print short titles under laminated plastic tabs.
- Drawings: Fold drawings to A4 size and accommodate them in the binders so that they may be unfolded without being detached from the rings. Provide with reinforced punched binder tabs.
- Contents: Drawings and technical data necessary for the efficient operation and maintenance of the installation. Include the following:
- Table of contents: For each volume. Title as cover.
- Directory: Names, addresses, and telephone and facsimile numbers of principal consultant, sub-consultants, contractor, subcontractors and names of responsible parties.
- Equipment descriptions:
    - Name, address and telephone and facsimile numbers of the manufacturer and supplier of items of equipment installed together with catalogue list numbers.
    - Schedules of equipment, stating locations, duties, performance figures and dates of manufacture. Provide a unique code number cross-referenced to the record and diagrammatic drawings and schedules, including spare parts schedule, for each item of equipment installed.
    - Operation procedures: Manufacturer's technical literature as appropriate.
    - Maintenance procedures:
    - Manufacturers technical literature as appropriate. Register with manufacturer as necessary. Retain copies delivered with equipment.
    - Detailed recommendations for preventative maintenance frequency and procedures.
    - Safe trouble-shooting, disassembly, repair and reassembly, cleaning, and alignment and adjustment procedures. Provide logical step-by-step sequence of instructions for each procedure.
    - Schedule of spares recommended to be held on site, being those items subject to wear or deterioration and which may involve the Principal in extended deliveries when replacements are required. Include complete nomenclature and model numbers, and local sources of supply.
    - Certificates:
    - Copies of suppliers warranties (or guarantees)
    - Copies of manufacturers warranties
    - Copies of Certificates from authorities.
    - Product certification.
    - Drawings: As built drawings.
- Format: Use the same borders and title block as the contract drawings. The Superintendent may supply transparencies of the contract drawings as the basis for work-as-executed drawings
- Maintenance: Maintenance and Operational manuals shall be submitted in triplicate. Warranties, Guaranties and technical brochures shall be provided in the manuals.

The Contractor shall arrange all necessary meetings to handover the Maintenance and Operational Manuals to the Principal. These meetings shall include the Contractor, the Superintendent and the Principals representatives.

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2.8 Training of Principal's Staff

The Contractor shall allow three working days for comprehensive education and training of the nominated Principal's personnel in the use and operation of all installed plant, equipment and systems, including engineering services installation.

It is the Contractor's responsibility to coordinate the education and training of the Principal's personnel. The training shall occur prior to the Date of Practical Completion and all plant and equipment must, at the time of training, be operational and commissioned.

2.9 Progress Photographs

The Contractor shall take colour digital photographs of progress of the works at fortnightly intervals between each site meeting. At each site meeting the Contractor shall submit one set of prints and the digital information on disk to the Superintendent.

The progress photographs shall be provided in A4 format and shall identify the project, date, time, location and orientation. A minimum number of ten photographs nominally 100 x 150mm shall be provided. This shall be provided in A4 bound format.

2.10 Warranties

Prior to, and as a condition precedent to Practical Completion, any work subject to the warranty as scheduled below, the Contractor shall deliver the relevant warranty.

Each warranty is to be in accordance with the proforma attached and following this clause. The warranty must be effective from the date for Practical Completion.

Each warranty provided in respect of any work referred to in sub-clause (a) of this clause will:

(i) be a warranty for the period designated for that work; and

(ii) be provided in writing duly executed by the supplier of the work, by the Contractor, and where the work is supplied by the supplier to a subcontractor, by that subcontractor.

The Contractor shall procure in respect of each warranty that all applicable stamp duty is paid and that the warranty is duly stamped to denote such payment, before the warranty is delivered to the Superintendent. In the event that in breach of this requirement any warranty is delivered to the Superintendent which has not been duly stamped, the Principal shall be at liberty to cause it to be properly stamped and the duty paid by the Principal shall be recoverable as a debt due by the Contractor to the Principal.

Each warranty will provide a comprehensive statement of details, materials, components and workmanship that are included in the warranty (refer relevant section of Specification) whether such items are supplied and/or installed by the Contractor or his subcontractor or by another party. Warranty of the whole shall imply warranty of each and every one of its parts, whether supplied or installed by the warrantor or by others.

The following provisions shall apply with respect to every warranty:

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(i) The warranty shall not in any way relieve the warrantor from any liability under any law or statute for the consequences of any negligence; and

(ii) Notwithstanding any limitations expressed or agreed under the conditions of the warranty, if any failure of or defect in the subject of the warranty is such that, if allowed to continue, consequential damage to the Works or any part of the Works can reasonably be expected to result and the warrantor, after receiving notification of the failure or defect, does not proceed with reasonable diligence to rectify the failure or defect, he shall be liable for the cost of repairing or reinstating such damage as the Superintendent may assess as having occurred after the time when action by the warrantor should have been taken and every warranty shall be required to contain provisions to this effect.

No warranty shall be construed as or have the effect of relieving the Contractor of any of his contractual obligations under the provisions of this Contract.

Schedule of Warranted Works

Item	***Warranty***
Roofing – steel deck, sealants	*10 years*
Roofing –gutters and downpipes, sealants	*15 years*
Roof Access systems	
Doors	*2 years*
Stormwater drainage	*10 years*
Plastering& render	*5 years*
Painting	*3 years*
Structural	*25 years*

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PROJECT NAME

FORM OF WARRANTY

THIS AGREEMENT is made the …..…… day of ……20……

between
……
… of

……
……
(hereinafter called 'the Warrantor), of the first part, and

……
…… of

……
……
(hereinafter called 'the Head Contractor' which expression shall include his permitted assigns) of the
second part.
……
……

……
…… of

……
……

(hereinafter called 'the Principal' which expression shall include his successor in title) of the third part.

WHEREAS:

a. The Head Contractor has entered into a Contract dated ……20…..
with the Principal for the erection of a building and/or other works (hereinafter called 'the works')
on the land at:…….

b. the said Works are to be carried out in accordance with the said Contract with drawings
and Specifications prepared by Paul Morgan Architects, and the Engineering consultants.

c. the Warrantor has contracted with the Head Contractor of the Works, namely ……..
…… (hereinafter called 'the Sub-contract Works').

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d. the Warrantor has agreed to give warranty and indemnity to the Contractor and to the Principal
in respect of the sub-contract Works for a period of …… effective
from the date of Practical Completion.

IT IS HEREBY AGREED AS FOLLOWS:

1. The Contractor warrants to the Head Contractor and also (as a separate warranty) to the Principal that all materials supplied by the Warrantor shall be in accordance with quality and/or standard not lower than the quality and/or standard stipulated by the relevant drawings and Specification and to the extent that quality and/or standard is not so stipulated, shall be of good materials and workmanship fit for the purpose or purposes for which the same are required to be supplied. This warranty shall be in addition to and shall not derogate from any warranty implied by law.

2 a. The Warrantor covenants with the Head Contractor and also (as separate covenant) with the Proprietor to replace and/or make good to the reasonable satisfaction of the Principal's Architect but at the expense of the Warrantor, so much of the sub-contract work as within the period stated on page 1 from the Practical Completion of the Works shall be found to be of a lower quality or standard than that referred to in Clause 1 or shall show deterioration of such extent that in the opinion of the Architect it ought to be made good or replaced in order to achieve fitness for the purpose or purposes for which the Works were performed or supplied and whether on account of utility performance appearance of otherwise provided however that this covenant shall not apply to deterioration or damage caused solely by excessive movement of building structure or by exceptional physical or other external cause or agency which is beyond the control of the Warrantor and which it could not reasonably have been expected to foresee or provide against.

b. The Warrantor further covenants with the Head Contractor and also (as a separate covenant) with the Principal to meet the reasonable cost of any work necessary to any part of the Works to enable the requirements of sub-clause 2(a) of this Warranty to be carried out and/or necessary to make good the Works afterwards.

c. The decision of the Superintendent as to

(i) any work or materials failing to comply with quality or standard as above mentioned or otherwise failing to comply with the foregoing warranty and/or

(ii) as to the extent of replacement and/or making good which shall be necessary to properly remedy the defects and/or

(iii) as to the extent of any work required under sub-clause 2(b) of this Warranty shall be notified in writing to the Warrantor and a copy of the notice shall be given to the Head Contractor, and thereon shall be final and binding upon the parties subject only to Clause 3 below.

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d. The Warrantor further covenants that within a reasonable time after written notification to the Warrantor of a decision of the Principal's Architect as to remedial work required as aforesaid, the Warrantor will replace and/or make good the sub-contract works or parts thereof and/or meet the cost of any work required by sub-clause 2(b) of this Warranty accordingly.

e. Within seven days after being notified of a decision by the Architect under any of the proceeding paragraphs, the Warrantor or the Head Contractor may give notice of arbitration thereon and in that event the question shall be referred to arbitration as hereinafter mentioned.

f. If within the time aforesaid (and the Architect's decision as to what is reasonable time in any case shall be final and binding upon the parties) the Warrantor shall fail to fully and properly carry out the said remedial work, the Head Contractor and/or the Proprietor may carry out such work, or cause the same to be carried out, and the Warrantor hereby agrees to indemnify and keep indemnified the Head Contractor and the Principal against all the costs and expenses of and incidental to the carrying out of the remedial work and also against any consequent or subsequent loss or damage sustained by them or either of them as a result of the Warrantor's failure as aforesaid.

3. It is mutually agreed between the parties hereto that in the event of any dispute arising with relation to any matter touching on or affecting those present to this agreement, such dispute shall be referred by either party to the independent arbitration of the President for the time being of the Victorian Chapter, Royal Australian Institute of Architects or his nominee in accordance with and subject to the provisions of the Arbitration Act of the State of Victoria or any Statutory modification thereof at the time being in force.

4. So far as shall be practicable the provisions of this document shall come into operation as between the Warrantor and the Head Contractor as soon as it has been executed by them, notwithstanding that it may not have been or may not thereafter be executed by the Principal. Upon execution by all parties the provisions shall become fully binding on them.

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IN WITNESS WHEREOF the parties hereto have executed this Warranty on the dates hereafter shown.

THE COMMON SEAL OF
or signed by the
said Warrantor …… Date of Execution

in the presence of ……

THE COMMON SEAL OF
or signed by the said
Head Contractor …… Date of Execution

in the presence of ……

Signed by the said
Principal's representative …… Date of Execution

in the presence of ……

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2.11 Dilapidation Survey

The Contractor shall employ a suitably qualified and experienced consultant to

prepare a comprehensive dilapidation survey of the works area, including:

- Concrete slabs
- Balustrades
- Surrounding roads/pavements
- Existing building facades
- Adjacent roofs
- Central access building(lift/stairs)

The dilapidation survey is to include a written description and comprehensive photographic record of existing conditions.

The Contractor shall submit three copies of the dilapidation survey to the Superintendent. Additional copies shall be provided to each owner of their nominated properties/building. The dilapidation survey shall be provided in A4 format and should include diagrams and drawings of the premises to accompany and clarify the photographs and text.

Prior to the commencement of any work on site, the Contractor shall arrange for a joint inspection of the premises by his nominated representative, the Superintendent and the Principal.

The Contractor shall be responsible for gaining approval of the adjoining owners that the dilapidation survey is a true and accurate record of the condition of the buildings.

If the dilapidation survey does not record the condition of the buildings or any part of the buildings it shall be deemed that there are no defects or damage.

Any subsequent damage to these premises shall be made good by the Contractor at his expense. Should the Contractor notice damage done by others he must immediately notify the Superintendent.

The Contractor shall maintain periodic inspections to investigate any evidence of or claims of damage to adjoining properties as a result of the execution of the Works. Keep records of any investigations on site and make them available for inspection by the Superintendent until Practical Completion of the Contract.

Maximum duration between inspections – four calendar weeks.

2.12 INSPECTIONS AND CERTIFICATES

Notices/Inspections/Certificates

The Contractor shall give the Superintendent and their consultant advisers sufficient notice so that all required tests and inspections can be witnessed. The Contractor shall not carry out any of the required tests or compliance inspections without approval.

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In all cases where an inspection is to be made or a test to be undertaken by the Superintendent or their consultants, or the Building Surveyor, or any Authority having jurisdiction over the works shall be a minimum of 48 hours notice.

The Contractor shall manage and coordinate their works to ensure that this notice can be provided in all instances.

Except for site tests and those by the building surveyor and statutory authorities the Contractor shall carry out testing using agencies accredited by the National Association of Testing Authorities (NATA) to test in the relevant field. The Contractor shall cooperate as required with all testing authorities.

The Contractor shall submit reports showing the observations and results of tests and compliance or non-compliance with the requirements of the contract. These reports shall be forwarded to the Superintendent within 2 working days of the tests being undertaken. A copy of the submitted report and test certificates shall be retained on site.

If tests and inspections are to be carried out on parts of the works, do not conceal those parts and do not commence further work on those parts, until the tests and inspections have been satisfactorily completed and compliance substantiated.

2.13 Building Surveyor

The Principal, before entering into the contract has lodged four sets of documents with the following building surveyor:

Stan Tsantis, McKenzie Group

With the exception of information to be provided by the Contractor the building permit is ready to be collected from the building surveyor.

The fees for the cost of regulatory advice up until the lodging of the four sets of documents with the building surveyor, together with cost of the building permit have been paid by the Principal. The Contractor shall pay all required fees and obtain building certification for the work.

The Contractor shall be responsible for the lodgement of all other required documents and pay all fees and obtain all permits and approvals by other authorities.

Section 33 of the Building Act 1995 requires that the Contractor for the building work for which a permit has been issued under part 3 must notify the relevant building surveyor without delay after completion of each mandatory notification stage of that work. It shall be the Contractor's responsibility to directly notify the nominated building surveyor.

The mandatory notification stages are: (To be confirmed with building surveyor)

- *public protection works*
- *completion of framing*
- *final inspections*

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There will be a number of inspections required under each of these mandatory notification stages and the Contractor shall liaise with the nominated building surveyor to manage and coordinate all inspections. This is a responsibility of the Contractor and should be coordinated directly with the building surveyor and does not require notification of the Superintendent.

Upon request from the Superintendent the Contractor shall furnish to the Superintendent copies of all correspondence, inspections and notices between the Contractor and the nominated building surveyor.

In addition the Contractor shall note that the Superintendent and their consultant team shall make periodic inspections of the works to review conformity with the contract documents. They are also required to make inspections of footings, structure, samples, prototypes and the like. This is a separate process of inspection from the statutory inspections required by the building surveyor. The Contractor is advised in the contract documents of the items requiring inspection by the Superintendent and the consultant team and they shall provide notification as previously specified.

2.14 Inspection of Roads, Footpaths, Kerbs and Liability for Subsequent Damage

Prior to commencement of work, the Contractor shall arrange for a joint site inspection by his own representative and a representative of the Municipal Engineer as appropriate, to list any existing damage to Roads, Footpaths, Kerbs, Channels, Nature Strips, etc. Such a list shall be prepared in triplicate, endorsed by both parties, dated, one copy retained by each party and one forwarded to the Superintendent as soon as inspection is completed.

Failure by the Contractor to take such action will be accepted as notice that there are no defects or damage.

Any subsequent damage to these installations shall be made good by the Contractor at his expense. Should the Contractor notice damage done by others, he must immediately notify the Superintendent.

If the Principal then recovers costs from those causing the damage the Contractor will be credited to the extent. Such action by the Principal does not relieve the Contractor of the primary responsibility of making good.

2.15 Essential Services

Requirement:

The following inspections and tests, where applicable are to be carried out during the

Defects Liability Period and thereafter for as long as the building is under the control

of the

Contractor:

Essential Services to be inspected or tested	Installation standards/ level of	Nature of inspection or test, frequency

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	performanc e	
Paths of travel to exits	BCA Section D	3 monthly inspections to confirm travel paths are intact

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2.16 PROJECT INFORMATION

Diagrammatic Layouts

The Contractor shall note that the layouts of service lines, plant and equipment as shown on the drawings are diagrammatic only, except where dimensions are provided. Before commencing work the Contractor shall obtain measurements and other necessary information to identify their location.

In relation to service lines in the ground or concealed within the existing building fabric the Contractor shall research all information available from:

- relevant authorities having jurisdiction over the works
- original construction documents
- pit covers, inspection openings and access panels as shown and as can be inspected on the site
- other information made available by the Superintendent, the consultants or the Principal

The Contractor shall allow for all necessary test pits, excavation, demolition and research as necessary to accurately locate the services.

The Contractor shall take care when excavating and demolishing to locate service lines in accordance with the procedures established in their project specific Occupational Health and Safety Guidelines. The Contractor may encounter other services whilst endeavouring to accurately locate service lines and their excavation and demolition procedures shall be undertaken with extreme caution. The Contractor shall include the costs of all procedures required to comply with the Occupational Health and Safety Guidelines in their tender sum.

2.17 Design Intent

The works are to be carried out in the spirit and true intent and meaning of the drawings and the specification, where the same may or may not be particularly shown on the drawings or described in the specification, provided the same is reasonably inferred from them. Should the Contractor find any discrepancy in the drawings or between the drawings and the specification, they should immediately notify the Superintendent who shall be the sole arbitor as to the course of action to be followed.

2.18 Abbreviations

The contract documents use abbreviations as listed in Appendix A, Finishes Schedule. These abbreviations are used on drawings and are defined/given meaning in this Appendix.

2.19 Tolerances /Incidentals/Packing

The Contract includes all work incidental to the work specified herein and necessitated by the condition of the building or materials, either as specified or as discovered during the progress of the work. The Contractor shall be responsible for taking all sizes from the actual work.

The Contractor shall allow for all packing, trims, cover strips, incidental framing, and the like or as necessary to provide a complete and operational building described in the drawings and specifications.

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The Contractor must co-ordinate all tolerances and packing necessary to construct the Works. Primary structural elements, secondary systems, facades and finishes all have different tolerance requirements and the contractor must make due allowance for packing, shims, adjustments and incidental framing required to meet the tolerances defined in Australian Standards, Manufacturers recommendations, or as stated below, whichever is the lesser. Maximum tolerances generally are:

Primary Structural Elements +10mm to – 10mm
Secondary Framing Elements +5mm to – 5mm
Facades / Finishes +2mm to – 0mm
Floors +2mm to – 2mm (maximum deviation of 3mm under a 3.0m straightedge)

2.20 Materials and Components

a) Sources Policy

In accordance with Victorian Government Industry Development policy, maximise local content (i.e. Australia or New Zealand sourced) within the principle of value for money.

b) Use of Victorian Rainforest Timbers Prohibited

It is prohibited in this Contract to use:

A) Timber harvested from a Victorian cool temperate or warm temperate rainforest as defined by the Department of Conservation and Natural Resources; or

B) Timber harvested from land adjacent to a rainforest, constituting a rainforest buffer area as defined by the Department of Conservation and Natural Resources.

c) Proprietary Items

Definition: A proprietary item is an item identified by naming manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.

Where proprietary items have been included in contract documents, the Contract sum shall be deemed to have included for the use of said items**.**
If alternatives are proposed, submit proposed alternatives and include available technical information, reasons for proposed substitutions, cost and other required information **at the time of tender**. However, tenders shall be prepared on the basis of the items nominated. Alternatives shall only be **proposed** at the time of tender. State whether use of proposed alternatives will require alteration to other parts of the works and advise consequent costs.

Acceptance of alternatives: The Superintendent may reject alternatives proposed.

d) Manufacturers' or Suppliers' Recommendations

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The Contractor shall select, if no selection is given, and transport, deliver, store, handle, protect, finish, adjust, prepare for use, and use manufactured items in accordance with the current written instructions from the manufacturer or supplier.

The Contractor shall submit the instructions, and advise of conflicts with other requirements.

Advise of activities that supplement, or are contrary to, manufacturer's or suppliers' written instructions.

e) Sealed Containers

If materials or products are supplied by the manufacturer in closed or sealed containers or packages, bring the materials or products to point of use in original unbroken containers or packages.

f) Tolerances

Enforce tolerances. Do not permit tolerances to accumulate.

g) Consistency

For the whole quantity of each material or product use the same manufacturer or source and provide consistent type, size, quality and appearance.

h) Synthetic Mineral Fibre Products

Where the contract documents require the demolition or construction use of synthetic mineral fibre products, the contractor shall, together with the Superintendent's Representative, determine, agree and confirm:

(a) the type and scope of all works where the handling or use of such products is involved;
(b) the applicable exposure standards for atmospheric contaminants appropriate to such synthetic mineral fibre products; and
(c) acceptable procedures for the ordering, receipt, transport, storage and handling of the specified products in all respects, inclusive of considerations of occupational health and safety.

2.21 Synthetic Products

Where the Contract Documents require the demolition or construction use of synthetic mineral fibre products, the Contractor shall determine:

(a) the type and scope of all works where the handling or use of such products is involved;
(b) the applicable exposure standards for atmospheric contaminants appropriate to such synthetic mineral fibre products; and
(c) acceptable procedures for the ordering, receipt, transport, storage and handling of the specified products in all respects, inclusive of considerations of occupational health and safety.

and allow for these works in the Tender Sum.

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2.22 COMPLETION

Construction Validation

Construction Validation procedures must be performed by the Contractor to ensure that the Works conform in all respects to the Contract Documents, relevant Australian Standards and the functional and performance requirements of the Contract.

Construction Validation must be performed under operational conditions and only on the completed Works.

To perform the procedures of validation, the Contractor shall undertake comprehensive audits, tests and inspections to verify conformity of the Works, and provide a written certification that the Works have been performed in accordance with the Contract. Should the audit procedure identify that there are incomplete items or outstanding defects, then these shall be rectified, reinspected and subsequent to validation of the Works by the Contractor.

The validation process must be undertaken by the Site Manager, the Foreman and key representatives of their subcontractors. The written verification requires all three parties to sign the report as acknowledgement that the works are in conformity with the contract documents.

The Contractor must establish and maintain documented procedures for inspection, testing and validation to ensure that the requirements for the project are met. The required inspection, testing and validation must be detailed in the Contractor's Project Quality Plan. At a minimum it must include an A4 validation sheet for every room and space (example attached). The Contractor must carry out all final inspections and testing in accordance with the Quality Plan and documented procedures to provide evidence of the conformance of the finished Works. The Quality Plan for inspections and testing must require that all specified inspections and tests have been carried out and that the results meet the specified requirements.

No defects inspection by the Superintendent shall be undertaken Construction Validation has been completed to the satisfaction of the Superintendent and:

- the associated data and information has been made available to the Superintendent;
- all defects, incomplete works and non-conformities identified in the Contractor's validation process have been rectified by the Contractor.

The Contractor's validation process must be documented in the Quality Plan in sections which represent the main specification headings in this document. Evidence must be provided that all suppliers, products, systems and services have been inspected and/or tested. The records must show clearly whether the product has passed or failed the inspections and/or tests according to defined acceptance criteria. Where there is failure to pass any inspection and/or test, the procedures for control of non-conforming products must apply.

The validation process should be undertaken prior to Practical Completion and the certification provided to the Superintendent.

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The purpose of validation is to establish total conformity of the completed Works under operational conditions and requires the auditing of all the component systems.

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CONSTRUCTION VALIDATION SHEET

Project:

…….....
.....

Address:

…….....
.....

Room No: ……. **Location**:

…….....

1.	The Contractor herewith certifies that the work in this area has been performed in accordance with the Contract Documents and relevant Australian Standards. This area has been inspected and we have verified that it has been completed, commissioned, balanced and tested under operation conditions. We advise that this area is complete for handover with the exception of the non-conformities identified below.	
2.	All equipment in this area is installed and commissioned to the extent nominated in the Contract Documents including items identified under the separate contracts clause in the specification.	
3.	To the extent required by the contract all loose furniture, joinery and built-in cabinetry in this area has been completed and is installed.	N/A
4.	Hardware has been installed in all doors and joinery, is operational and has been eased? Keys to this area have been labelled and provided to the Superintendent.	
5.	The mechanical works in this area have been commissioned, balanced, and are full operational. They have been constructed in accordance with the Contract Documents and relevant Australian Standards. The mechanical works have been tested and we certify that they meet the documented performance and operational criteria.	
6.	The electrical works in this area have been commissioned, balanced, and are full operational. They have been constructed in accordance with the Contract Documents and relevant Australian Standards. The mechanical works have been tested and we certify that they meet the documented performance and operational criteria.	
7.	The fire services in this area have been commissioned, balanced, and are full operational. They have been constructed in accordance with the Contract Documents and relevant Australian Standards. The mechanical works have been tested and we certify that they meet the documented performance and operational criteria.	N/A
8.	The communications services in this area have been commissioned, balanced, and are full operational. They have been constructed in accordance with the Contract Documents and relevant Australian Standards. The mechanical works have been tested and we certify that they meet the documented performance and operational criteria.	N/A

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9.	The security services in this area have been commissioned, balanced, and are full operational. They have been constructed in accordance with the Contract Documents and relevant Australian Standards. The mechanical works have been tested and we certify that they meet the documented performance and operational criteria.	N/A
10.	The finishes in this area have been completed (including rectification of finishes where affected by other trades and where defects have occurred) and are in accordance with the Contract Documents.	
11.	We advise that following completion of the non conformities, we will request a Defects Inspection from the Superintendent.	
12.	Incomplete works and non-conformities:	

Signed ……..

……..

for (Contractor) Site Manager Foreman

Date: ……..

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2.23 Commissioning

The Contractor must undertake the process of construction validation after all building and system components have been commissioned.

For all commissioning and testing, the Contractor must ensure the performance and operation of all systems and each item of equipment specified. The Contractor must ensure that systems are operating stably and reliably for the Principal's operation and that the as-built drawings and Operational Manuals have been provided.

The Contractor must ensure that each system to be tested is supported by the required services, equipment and resources.

During the commissioning period make all adjustments and carry out all changes necessary to meet the specified performance and to establish safe, reliable and tested operational systems. Commission and test each system and record all results.

2.24 Defects

Prior to Practical Completion defects inspections of the Works by the Superintendent and the Consultants are required. These inspections are to assess the Works as applicable for Practical Completion. The Contractor must organise and coordinate defects inspections with the Superintendent and Consultant team and the Superintendent/Consultants will prepare the defects lists. The defects lists are not a finite list, and they do not relieve the Contractor of any contractual responsibilities including scope, workmanship, compliance and accuracy.

The Contractor must provide the Superintendent 48 hours notice of when the Works are ready for a Defects Inspection. The Contractor must undertake all items described in " Practical Completion of the Works" Clause 2.7.6 – prior to requesting or requiring the Superintendent to undertake a Defects Inspection.

The purpose of the Defects Inspections is to allow the Consultants to assess the Works to an extent to satisfy themselves that Commissioning and Construction Validation has occurred.

The Superintendent will furnish a Defects List to the Contractor within 5 working days of the inspection provided that all requirements described in "Practical Completion" have previously been satisfactorily completed by the Contractor.

The Superintendent will prepare the Defects List and schedule into the following categories:

Category 1.

Minor defects and minor omissions which may prejudice the convenient use of the Works and must be rectified prior to Practical Completion. The rectification of Category 1 is a condition precedent to the issuance of a Certificate for Practical Completion.

Category 2.

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Minor defects and minor omissions which must be rectified within 15 working days of the issuance of the Defects List(s).

The Contractor must complete the defects listed by the Superintendent in Category 2. within 15 working days of receipt of each Defects List. The Tenderer must allow for the Project Foreman to remain on site full-time until all defects on the list are completed.

Should the Contractor fail to rectify the defects within the 15 working days, then the Superintendent may elect to engage the services of others to complete the outstanding defects. The costs associated with having these works performed by others will be borne by the Contractor.

If rectification of defects is performed by others, due to the failure of the Contractor to meet the provisions of this clause, the Contractor must continue to warrant the whole of the Works including the defective work rectified by others.

Category 3.

Minor variations (not defects but deemed necessary to complete the Works) to be undertaken in a timely manner.

2.25 Cleaning

a) During Building Operations

The Contractor must make full provision for the daily removal of all rubbish, debris and redundant materials to ensure the clean and orderly performance of the works.

All materials delivered for incorporation into the works shall be tidy and stacked and stored in a safe manner.

Remove all plant and equipment no longer required from time to time as soon as possible.

b) On Completion

All of the following will be undertaken prior to the Works being occupied by the Principal:

a) <u>General</u>

Each area on completion shall be thoroughly and carefully cleaned out, including scrubbing, polishing and dusting, as necessary, to leave in perfect order and this includes all surfaces, including walls, floors and ceilings.

b) <u>Glass, etc</u>

Shall be cleaned by approved expert cleaners and all pint stains, putty smears etc., removed without damage to glass, frames or surrounding surfaces.

c) <u>Finishes:</u>

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Provide careful cleaning off of all paint, cement, plaster, putty smears, etc., from internal and external wall, ceiling and floor finishes, as well as to external surfaces.

d) External:
Remove all debris from the confines of the entire site. Remove all debris, nails, washers and all objects from the entire roof surfaces and gutters.

e) Painting, colouring etc:
Shall be handed over in perfect order. Touchup, repaint, etc., as may be required to remove any stain, marks or blemishes prior to the actual occupation of the rooms concerned by the Proprietor.

f) Grease:
All windows and doors and oil locks immediately prior to handing over.

g) Keys:
Hand over keys, all properly labeled, together with a full schedule. Hand over all Master Keys from the supplier direct to the Superintendent.

h) Warranties:
Hand over all Warranties required by this Specification and in accordance with Conditions of contract.

i) Maintenance
The Contractor shall provide maintenance procedures for all items of plant and equipment, operational components of the building and all finishes. (Internal and external). The Contractor must provide a comprehensive maintenance report for the principal's ongoing building maintenance. It must be provided within two weeks of the date of Practical Completion.

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3 ROOFER

3.1 General

Provide the whole of the building with a full weathertight roofing system of the type noted complete with all necessary accessories, trim and roof plumbing, including flashings, joint sealants, finishes and means of conveying roof water away from the building.

Secondary steel framing:
Provide all required secondary steel framing required to support the work of this trade not otherwise provided by the STRUCTURAL STEEL trade

Hold Points:
Do not commence work or proceed to the next stage of work before approval of the required Hold Points. Required Hold Points before commencing on-site include:

- Product Data.
  Intermediate Hold Points include:

- Field Testing (down-pipe leakage).
  Certification requirements include:

- Product Certification.
  Conditions Precedent for Practical Completion include:

- O&M Manual.
- Warranties.

References and Relevant Standards:
Comply with the current edition of the relevant Standards.

Metal Roofing:

AS/NZS 1562	Design and installation of sheet roof and wall cladding.
SAA HB 39	Installation code for metal roof and wall cladding.
AS 3566	Self-drilling screws for the building and construction industries.
AS3500.3.2003	Plumbing and Drainage Stormwater Drainage

Rainwater goods:

AS/NZS 2179	Specification for rainwater goods, accessories and fasteners
AS/NZS 2179.1	Metal shape or sheet rainwater goods, and metal accessories and fasteners
AS 2180	Metal rainwater goods - Selection and installation.

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Where Standards are nominated in the Product Data, the work shall comply with such Standards. Submit copies of nominated Standards, if directed.
Health and safety:

Construction methods shall comply with legislative requirements and accepted industry practice with regard to the health and safety of construction personnel.
The installed work shall comply with legislative requirements and accepted industry practice with regard to the health and safety of users and maintenance personnel responsible for the in service operation, cleaning and maintenance of the work.
Comply with the relevant legislative requirements and the regulations of the relevant Authority.

Building Code:
Comply with the relevant parts of the Building Code.

* BCA J1 Building fabric

* BCA J3 Building sealing

Verify the Climate Zone before commencing.

3.2 Submissions and Guarantee

Submit Product Data for materials and products, including manufacturer's instructions, properties, test results, Engineering computations for thermal performance, construction details and any options, as appropriate. Include Product Data for adhesives, fixings and joint-sealants not indicated on the Drawings.

Upon practical installation of the roof by a Manufacturer's Approved Contractor, a 10 year Watertight Installation Guarantee shall be issued covering all roofing products, the site workmanship and the watertight installation of the product. The warranty shall include particular reference to failure of, or due to, the following:

- Usual and unusual weather and wind conditions.
- Failure of system to exclude water and weather from inside the building.
- Failure of system to deliver water to drainage system.
- Structural integrity, including dislodgement due to wind.
  Failure of finished surfaces including discoloration, delamination, cracking or pitting
- Deterioration or dislodgement of joint joint-sealants, gaskets and flashings, including concealed and inaccessible items.
- Deterioration, damage, perforation or staining due to contact or close proximity with dissimilar metals or the environment generally.

Warranty conditions for roofing:
The warranty shall include particular reference to failure of, or due to, the following:
- The installer shall use the correct products for the installed condition.
- The installer shall be a specialist firm accredited by the manufacturer.
- Excessive deterioration with correct cleaning and maintenance.

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- Suitability of coating system for substrate type, exposure and use.
- Ultra-violet light, atmospheric pollution and weathering.
- Failure of coating to prevent corrosion or staining due to corrosion.
- All lifting shall be with a suitable system of slings approved by the manufacturer.

Warranty conditions for roof-mounted work:
The roofing warranty shall include particular reference to failure of, or due to, the following:

- Connections and penetrations related to services.
- Connections and penetrations related to roof mounted walkways, ladders, access points and the like.

The ROOFING trade shall coordinate with all trades for roof-mounted work, including equipment
and metalwork, and take complete responsibility for the durability and water-tightness of the roofing.

Warranty conditions for later penetrations:
The warranty shall include particular reference to failure of, or due to, the following:

- Later fixings and penetrations through the roofing or membrane system when carried out in accordance with the Product Data and the O&M Manual.

The Product Data and the O&M Manual shall include procedures for the later in-service
construction of penetrations and fixings through the roofing or membrane without voiding the warranty.

Provide for the Proprietor a written unconditional warranty covering faulty workmanship and materials in the roof construction for a minimum period defined in Section 3 of this Specification.

3.3 Performance requirements

Loads:
The installed work, including fixings and framing, shall accommodate all permanent and
temporary loads, individually and in combination, without failure, deflection, damage to adjacent or applied work, or risk to human safety. Comply with the relevant Standards.
AS/NZS 1170 Structural design actions
Maintenance loads:
The installed work shall accommodate loads and deflections due to maintenance personnel, procedures and equipment in accordance with the relevant Standards.
AS/NZS 1170.1 Permanent, imposed and other actions
Accessible horizontal or near horizontal surfaces including parapets, canopies and box gutters shall be considered to be trafficable and shall be capable of supporting such loads without damage or distortion, failure of fixings, or loss of water-tightness. Provide signage indicating maximum live loading capacity to trafficable surfaces.

Wind loads:

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The installed work shall accommodate the wind loads applicable to the site in accordance with the relevant Standards. AS/NZS 1170.2Wind actions.
Submit Shop Drawings and Engineering Computations of any additional bracing and framing, if required. Verify Terrain Category before commencing. Roofing shall resist uplift loads due to wind and air pressure.

Movements:
The installed work, including fixings and framing, shall accommodate all short and long-term movements and deflections in the base-structure, substrates to which the work is fixed, and within the work, including thermal movements, without failure or the transfer of loads from the base-structure to the work of this trade.
Make provision for thermal expansion at fixings and for large expanses of roofing. Make provision for differential movement between different adjacent materials.

Connections:
The installed work shall be connected to the base-structure or substrates in a neat, substantial manner by correctly selected and located connections which transfer the loads from the work without displacement, distortion, or damage to the fixings, substrates or the adjacent work.
Connections shall accommodate movement requirements.

Sharp edges:
There shall be no sharp edges or projections which could cause human injury including injury to maintenance personnel. Metal edges and corners subject to human contact, including unintentional contact, shall be rounded and smoothed to prevent human injury (including when cut on site).

Corrosion:
Materials and products, including fixings and concealed components, shall be corrosion resistant or protective coated to prevent corrosion.

Compatibility:
Adjacent materials and products shall be chemically and electrolytically compatible with each other, substrates, and adjacent work, or shall be separated by suitable spacers. Adjacent materials and products, including adhesives and joint-sealants, shall not stain or contaminate, and shall not cause visual or structural defects in adjacent materials.

Sealing junctions:
Seal joints and junctions to adjacent work where required to maintain integrity of fire, smoke, acoustic and moisture barriers. Coordinate with trades for adjacent work as required. All insulation, vapour barriers and sarking to building envelope shall be continuous , unbroken, and properly sealed at all edges, junctions and penetrations, and shall be vapour-proof and moisture-proof. Overlap, tape and seal all joints, perimeters and junctions as applicable and repair all breaks, gaps and discontinuities. Give sufficient notice so the Superintendent may inspect installed work before covering over.

Weather protection:

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The installed work shall be weather-tight and water-tight, and shall exclude water and moisture from entering the inside of the building in all weather and rain-fall conditions. The installed work shall discharge all water and moisture, including leakage and condensation, to the exterior of the building or into the drainage system.

Thermal insulation:
The installed work shall provide continuous thermal insulation to minimise heat gain or loss from outside in accordance with the Building Code requirements and the relevant Standards.

Emergency drainage and back-up systems:
Provide emergency overflow and relief systems to prevent flooding in the event of blockage or malfunction.
Comply with the relevant Standards for Overflow Devices - Box Gutters.
SAA/SNZ HB 114 Guidelines for design of eaves and box gutters
AS/NZS 3500.3 Stormwater drainage
Submit details of proposed overflow and relief systems. Include at least one emergency overflow for each section of roofing gutter, and overflow weirs between high-points of adjoining gutters.

Perforated baffles to roof drainage:
Provide perforated baffles to roof gutters, down-pipe entries and drains to prevent ingress of hail, air-borne leaves and other debris which may cause blockages and resultant flooding. The expression 'perforated baffles' shall include the meanings 'leaf guards' and 'hail guards'.

Maintenance access equipment:
Coordinate and cooperate with FALL-ARREST SYSTEMS trade for installation of life-line equipment, procedures and loads. Receive and build-in components from other trades as required. Provide required fixings. Make penetrations, install components to the correct tolerances, and make good where maintenance access equipment requires fixings through the work of this trade. Indicate details on Shop Drawings.

Services reticulation:
Coordinate and build-in reticulated services passing through the work. All surface penetrations shall be properly flashed and sealed.

Framing and bracing:
Provide sufficient framing and bracing to ensure the work is rigid and safe under all loading and height conditions, including later applied work by other trades, and at openings, terminations and junctions. Coordinate with related trades as required. All framing and bracing shall be integrated with the work and concealed. Verify types and loads of applied work before commencing.
Submit Engineering Computations if directed.

Installation tolerances:
Installation tolerances generally shall not exceed:
* Position on plan, or vertical surface: +/- 5 mm.
* Deviation in level (horizontal): Not more than 1 in 1000 (maximum 5 mm).
* Deviation in plumb (vertical): Not more than 1 in 1000 (maximum 5 mm).
* Edge straightness: +/- 2 mm per metre length (maximum 5 mm).

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Installation tolerances shall not be cumulative and shall not include base-structure, substrate or fabrication tolerances. Installation tolerances for substrate framing shall be within the limits for the required tolerances of the finished applied sheeting.

Vermin:
The installed work shall prevent access and concealed breeding places for vermin. Provide suitable corrosion-resistant mesh and baffles scribed to fit adjacent work, as required. Baffles may include purpose made closed cell polyurethane foam to match roof profiles.

Maintenance and services access:
Provide suitable hatches, panels and covers for maintenance and cleaning and for access to existing services. Include suitable locking mechanisms where required for security. Parapets and related horizontal surfaces to cladding and roofing shall be regarded as trafficable, and shall accommodate live loads of maintenance personnel and equipment.
External hatches, panels and covers:
External hatches, panels and covers shall be water-tight and weather-tight. Include surrounding upstands and flashings, as required.

Parapets:
Parapets, cappings and related horizontal or near horizontal surfaces shall not shed surface water or moisture onto adjacent visible cladding or wall surfaces. Such horizontal surfaces shall be sloped to drain surface water or moisture away from visible cladding surfaces and into the roof drainage system. Refer Render specification.

Overhanging edges:
Provide drip moulds or grooves to all overhanging surfaces and profiles to shed water and prevent migration and tracking of surface water to adjacent surfaces. Drip moulds should be not less than 10 x 10 mm.

Testing:
Before installation - factory-fabricated ‘siphonic’ box gutters:
Carry out hydrostatic testing of all factory-fabricated box gutters before delivery. Test period shall not be less than two hours. Rectify any leaks and re-test.
After installation:
Carry out hydrostatic testing of rainwater goods after installation.
The test period shall not be less than two hours. Rectify any leaks and re-test. The testing shall include:

- All box gutters and sumps located over internal rooms.
- All downpipes and sumps carried out by this trade.

Coordinate with the HYDRAULIC SERVICES trade as required.

3.4 Siphonic Roof Drainage System- Design & Construct
(Syfon Systems or similar approved)

Generally:
The entire Siphonic roof drainage system, inclusive of design, prefabrication, supply and installation shall be a Design and Construct contract carried out by a nominated specialist siphonic contractor with a proven track record in siphonic roof drainage.

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Contact: Ph: 1300 1SYFON
E-mail: syfon@syfon.com or lachlan.nunn@syfon.com

Siphonic Design Parameters:
The design for the Siphonic roof drainage system will be in accordance with AS3500.3.2003 for all roof areas.

The design will incorporate a 100% Primary Siphonic system relevant to the local Rainfall Intensities (RFI) for either a Q20 (1:20 year RFI) for Eaves Gutters or Q100 (1:100 year RFI) for Box Gutters and be protected by an Overflow System (Siphonic or conventional) capable of performing to the same design criteria, that being 100% capacity.

The combination of the Primary and Overflow systems to achieve a 100% capacity is not acceptable to AS 3500.3.2003.

The design process will address the Siphonic prime times, Gutter Flow and fill times utilizing unsteady siphonic modelling and spatially varied flow programs to ensure the Overflows will not work during the design storm.

The calculations for the size and position of roof gutter siphonic inlets, horizontal and vertical pipe work, including bends, branches, junctions and their connections to any associated underground pipe work will be prepared by an approved siphonic specialist. These calculations are to be based on detailed architectural and hydraulic engineering drawings of the project together with the local rainfall intensities as mentioned above.

The pipework system shall be sized to convey the design roof water flow from the syfonic inlets through the system to the point(s) of discharge via the most efficient possible direction. The minimum velocity shall be 1.0 m/s for self-cleansing purposes. The maximum negative pressure in the system shall not exceed 8.0m water column – (-800 mbar)

Siphonic Pipework:
All pipes and fittings will be manufactured predominantly from High Density Polyethylene (HDPE), with pressure ratings of PN4(SDR33) or PN6.3 (SDR26).
The Pipe will also carry Watermark level 2 approvals and be manufactured in accordance with AS 4130. Stainless Steel 304 and 316 pipes are also permitted, however the usage of non - pressure UPVC pipe is not permitted.

All HDPE pipework and fitting joints, prepared during the fabrication phase, will be butt fusion joints, utilising approved butt fusion welding equipment under factory controlled conditions.

All site joints will be either butt fusion welds utilising approved butt fusion welding equipment or Electro-fusion sleeves installed strictly in accordance with the manufacturer`s instructions or Lyster welds done by accredited welders.

Pipe joining can be either butt weld or electro fusion installed strictly in accordance with the Manufacturers instruction.

Siphonic Inlets:

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Inlets supplied by the Siphonic contractor will be installed into the gutter by the roofing contractor or the concrete decks by the builder.

All siphonic inlets for the collection and discharge of the surface water from the roof will be Siphonic Roof Inlets incorporating leafguards when installed in box gutters or load bearing trafficable grates when installed in carpark decks. Inlets will be square in shape with a threaded connection at the base.

Siphonic inlet bodies are to be manufactured from either HDPE (High Density Polyethylene) or 316 stainless steel and formed from a single sheet of material inclusive of the inlet spigot. The inlet body is to include a fixing flange for connection into box gutters or to the load-bearing grate and fixed generally in accordance with AS2179.

Connection of the siphonic inlet to the pipework system will be with a male DIN threaded HDPE coupling to the siphonic inlet female coupling or equivalent. Any fixings that require holes to be made in the inlet body are not permitted.

Siphonic inlet baffles will be designed to restrict the entry of air to the system and will be made of a durable material. The leafguard will be fitted to the gutter siphonic inlets and will be designed to restrict the entry of debris into the system without unduly restricting the flow. The leafguard will be made of a durable material.

All inlets are self-priming, avoiding any build up of water within the gutter or over the slab.

Siphonic Support System:
The support system for the HDPE will generally be a rail and channel system securely fixed to the main building structure. Pipes and fittings will be securely suspended from the suspension rail by means of purpose made and fixed anchor pipe clamps.

Pipe clamps will be fixed so as to restrict the effects of thermal expansion and contraction of the pipework and any possible water hammer that may occur, extra restraint shall be provided at all changes of direction in the main lines to prevent any movement of the pipe.

Pipe clamps will be fitted at each side of branch connections and at no more than 10 times the pipe diameter on the collection mains. Vertical pipe work will be rigidly fixed to the building structure with pipe clamps not more than ten times the pipe diameter.
The collecting mains and downpipes will be supported generally in accordance with the intent of AS2180 and other relevant Australian Standards.

Siphonic Installation:
The whole of the installation will be installed only by fully trained and qualified personnel employed directly by the Siphonic roof drainage contractor who complies with a National EBA. All installers will be registered plumbers.

Siphonic Acoustic Treatment:
Install acoustic treatment to piping as and where shown on the drawings all in accordance with the Acoustic Engineers requirements.

Siphonic Connection to Stormwater collection point:

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The completed siphonic system shall be connected to stormwater according to Hydraulic Engineers Documentation and installed by the Civil Contractor.
‘

3.5 Materials

The Tender shall provide and install the following roofing and walling materials or equal approved equivalent:

a. Metal Deck Profiles
Refer Finishes Schedule Appendix A

b. Safety Mesh
Roofsafe/Roofguard. Galvanised to full extent of roofing, provide roof spacers and/or a suitable and safe roofmesh system to allow for the installation of insulation thickness as specified.

c. Cappings/Flashings
Generally: 0.8 BMT *Colorbond* to suit the roofing material and prevent galvanic corrosion on any part of the roof or rainwater goods. Colour is to match adjacent roof sheeting.

d. Gutters and Siphonic pipes
Siphonic Roof Drainage System’ (or similar approved alternative) Box gutters maximum size 600W x 150D Grade 316, 0.8mm thick stainless steel / 1.6 BMT where fully welded.
All box gutters to be equal in size. Provide Stainless steel gutter inlets and debris guards to manufacturer’s design and recommendation.
Gutter Supports according to manufacturer’s recommendation. Allow for continuous 18mm Marine plywood base as a minimum.

f. Downpipes/Spreaders
Siphonic Roof Drainage System (or similar approved alternative) HDPE pipework to manufacturer’s recommendation and design.

g. Downpipe clips
Siphonic Roof Drainage System (or similar approved alternative) to include hangers and unistrut continuous rail to manufacturer’s recommendation and design

h. Sumps
Siphonic Roof Drainage System (or similar approved alternative) to manufacturer’s recommendation and design.

i. Rainwater Heads
N/A. There shall be no Rainwater heads used on this project.

j. Overflow, inlets and outlets
‘*Siphonic Roof Drainage System (or similar approved alternative) SS overflow inlets to manufacturer’s recommendation and design.*

k. Fixings
The roof sheets shall be fixed accordance with manufacturer’s recommendations.

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l. Expansion joints to Roof and Gutters

Flat expansion joints shall be to manufacturer's recommendations and design, according to Australian Standards as described in this section.

3.6 Metal Roofing

a) Insulation and Sarking

N/A

b) Galvanised Safety Mesh

Lay galvanised mesh across purlins, stretched to 60mm sag. Fix to purlins as per manufacturer's specifications. Allow for insulation thickness to be installed as specified.

c) Fixing

Lay decking in single lengths to each slope and fix in accordance with the Manufacturer's manual. Exposed fixings must have colour matched EPDM seals and approved by Superintendent. Fixings in marine and industrial locations shall be Corrosion Resistance Class 4 (AS 3566).

Use starting/finishing strips at both sides of installation and button punch interlocking ribs at centres specified by manufacturer. Provide tape at sheet overlap – refer flashings below.

Form folded stop ends at tops of slopes and turn down ends of sheets into gutters.

Cut and cap where roofing changes slope. Caps to be snug fit over roofing, do not button punch.

Where the profile is to be laid to a pitch below the minimum recommended pitch, the side laps must be continuously silicone sealed and side stitched to manufacturer's instructions.

Where there are no cross-falls, the laying sequence shall ensure that side laps face away from the direction of prevailing weather.

3.7 Box Gutters

Form box gutters from 1.6 316 Stainless steel with minimum fall of 30mm. Width and depth shall be as indicated on drawings. Provide 50 x 6 thick SS gutter straps secured to structure at 600 centres maximum to suit falls. Fabricate to profiles shown in Architectural and 'Syfonic' drawings. Provide 18mm waterproof ply gutterboards for full width of gutters beneath all box gutters. Form over purlin and masonry anchor to blockwork/ or bolt to steel frame / or secure to studwork. Refer any discrepancies to Superintendent for clarification prior to fabrication.

3.8 Flashings to Roof

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a) Generally

Lap and secure all galvanized flashings. Make butt joints over a 75mm wide backing strip of the same material. Flashing material shall be 0.6mm thick.

b) Expansion Joints

Fold flashings back 40mm each side of joint leaving a 10mm gap. Interleave an expansion cap of the same material with the folds and welt the whole to the profile of the flashing. Set joint in mastic.

Provide expansion joints in all flashings at not greater than 6000mm.

c) Base Flashings

Shall have horizontal cover of 150mm vertically. Where on metal deck turn up ends of decking with watertight joints.

d) Cover Flashing (Spandek)

Shall overlap the vertical upstand of the base flashing by 100mm minimum. Cover flashings against brick and concrete walls shall be turned into sawcut reglets 12mm minimum. Silicone seal flashing reglet. Wedge at 200mm maximum centres with compatible materials.

e) Flashings around pipes, Penetrations through roofs

The upstand around the pipe shall be covered by 'Dektite' seals of the appropriate size as supplied by 'John Deks Pty Ltd' (or similar approved). Seals shall be installed in accordance with manufacturer's instructions. Dektite soaker flashings (or similar approved) to all penetrations. Ensure the compatibility of all seals and flashings with roof materials.

3.9 Roof Access Walkway/Fall Arrest/Anchorage Points

Roof access comprises of roof access platforms, static fall arrest lines and anchor points. The Contractor shall supply and install roof access platforms, static fall arrest lines and anchor points as indicated on drawings and the specification in Appendix B. Note: the products indicated in Appendix B are recommended only, alternatives which conform with this specification may be approved by the Superintendent.

Extent of walkway system is indicated on drawings. All walkway systems shall conform to AS1657-1992 and all relevant statutory Codes of Practice. Roof walkway shall be supplied and installed complete with all components and fixings.

Contractor shall provide all connections, start/finish plates and L connections all as necessary to complete the works.

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4 PAINTER

4.1 General

The work included in this section of the specification comprises the supply and installation of all painting for the Works, together with all consequential and/or incidental work which may be or become necessary though not specified or shown in detail. The Contractor must supply and install all painting for the Works unless specifically noted otherwise.

This section of the Specification must be read in conjunction with all other contract documents.

Hold Points:
Do not commence work or proceed to the next stage of work before approval of the required
Hold Points. Required Hold Points before commencing on-site include:

- Control Samples.
- Product Data.

Intermediate Hold Points include:

- First Completed Example.
- Field Testing (for adhesion and dry film thickness).

Conditions Precedent for Practical Completion include:

- O&M Manual.
- Warranties.

Other Hold points include:

- Verification of colour selections.

4.2 Standards

The Contractor must comply with all relevant Australian Standards and any current and relevant Product Specification Sheets, Data Sheets and Material Safety Data Sheets.
Relevant Standards:
Comply with the current edition of the relevant Standards.

AS/NZS	1580 Paints and related materials - Methods of test.
AS 1627	Metal finishing - Preparation and pretreatment of surfaces.
AS 2310	Glossary of paint and painting terms.
AS/NZS 2311	Guide to the painting of buildings.
AS 2700	Colour standards for general purposes.
AS 3730	Guide to the properties of paints for buildings.

Where Standards are nominated in the Product Data, the work shall comply with such Standards. Submit copies of nominated Standards, if directed.

4.3 Materials and Labour

The work to be done under this Contract must include all labour and materials, equipment and services, necessary for and incidental to, the painting of all work throughout the building.

The Contractor must examine all other sections of the Specification, and must thoroughly familiarise themselves with all their provisions regarding the painting and

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understand which are left unfinished, by requirement of the other sections of the Specification.

All materials shall be of the type specified and/or scheduled. They shall conform to all current relevant standards issued by the Standards Association of Australia, and shall be delivered to site in unopened cans or packets. No site tinting is permitted.

Paint materials shall be manufactured by Dulux Australia no other brands will be permitted. The Contractor must furnish evidence of this requirement if requested by the Superintendent.

The Contractor must obtain all relevant Material Safety Data Sheets showing the health and safety precautions to be taken during application of Dulux products and is responsible for implementing those precautions.

Manufacturer and batches:
All products in each coating system shall be from one manufacturer. Do not combine products from different manufacturers. Products used in each installation area and finish type shall be from the same production batch.

Grade of paint:
Where the manufacturer makes more than one grade of any coating product, use the highest grade ('premium' grade), whether the product is indicated by name or not. Do not use 'trade' grade products, including 'premium trade' grade products.
The use of 'trade' grade products in any part of the work may be grounds for rejection, and may require repainting of the whole area or item, at the sole discretion of the Superintendent.

Ultra-violet exposure:
Paint and coating products subject to direct and reflected sunlight, including internal locations, shall be ultra-violet resistant types.

Back-balancing of surface finishes:
Seal the reverse sides of sheet products (back-balancing) with equivalent properties to the front surface to minimise the risk of warping due to changes in moisture content.
Doors:
All four edges of timber doors shall be painted, unless otherwise approved. Coordinate with the DOORS & HARDWARE trade.

Compatibility with previous coatings:
Coating products shall be compatible with previous coatings or primers, if any, and with the substrates.
Inspect previous coatings and substrates, and ensure that proposed coatings are compatible. Verify compatibility before commencing.
Notify the Superintendent of any unusual conditions which may require a change to the coating system or preparation procedures.

Number of coats:
Opaque coatings:-
For opaque coatings, provide not less than TWO separate coats in addition to primer or undercoat.

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Substrate colours and surface variations shall not be visible through finished opaque coatings. Provide additional coats if required, to ensure:

- Sealing of porous substrates.
- Required film thickness.
- Consistent surface texture.
- Satisfactory opacity.

Coating thickness:
Coating thickness shall be sufficient to eliminate visible texture in the substrate.
Do not use paints to fill substrate voids and honeycombing. Fill and otherwise remove surface defects before application of paints and coatings.

Adhesion testing (Coatings):
After application:-
Carry out adhesion testing of applied coatings in accordance with the relevant Standards.

AS/NZS 1580	Paints and related materials - Methods of test.
AS 1580.408.4	Adhesion cross-cut.

Frequency of testing shall be sufficient to ensure a representative record of installation quality and conditions. As a minimum guide, carry out three tests per installation condition or area.

Dry film thickness testing (Coatings):
After application:-
Carry out on-site dry film thickness (DFT) testing of applied coatings in accordance with the relevant Standards.

AS/NZS 1580	Paints and related materials - Methods of test.
AS 3894	Site testing of protective coatings.
AS/NZS 3894.3	Determination of dry film thickness.

Frequency of testing shall be sufficient to ensure a representative record of installation quality and conditions. As a minimum guide, carry out three tests per installation condition or area.

Concrete pH testing:
Before installation:-
Carry out on-site pH testing of concrete and cementitious substrates before commencing application of paint and coatings.
Do not apply paint and coatings where the pH > 10.
Carry out suitable procedures to lower the surface pH where required. Do not apply acids or other compounds which may be harmful to concrete and cementitious substrates.

Frequency of testing shall be sufficient to ensure a representative record of installation quality and conditions. As a minimum guide, carry out three tests per installation condition or area.

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4.4 Storage and Disposal

The Contractor must provide an area in which to prepare and store the paint materials. The space must be kept neat and clean.

Place cloths, waste or other materials that might constitute a fire hazard in suitable metal containers, remove or destroy at end of each day's work. Remove all waste matter from the site in accordance with Authority Requirements. Dispose of all unused construction chemicals in a correct, safe and legal manner.
Construction chemicals include site applied paints, solvents, paint strippers and the like. Unused construction chemicals shall be stored separately and removed from the site to a legal disposal location or returned to the original supplier using suitable closed waste containers and vehicles.

Submit a detailed Methods Statement indicating the complete chain of supply and disposal, including names and addresses of all original suppliers of chemicals and receivers of waste. Include all relevant Materials Safety Data Sheets (MSDS).

Do not place unused construction chemicals in general waste disposal containers unless approved in writing. Do not leave, conceal bury or otherwise dispose of unused chemicals on site or adjacent to the site.

Any areas or locations where unused construction where chemicals are found, may be remediated by third parties engaged by the Superintendent at the Superintendent's sole option. The Contractor shall pay for the cost of all such remediation, including the costs of all consultants engaged to manage the remediation, and including the additional costs of the Superintendent. Remediation may include remediation required to any affected adjacent property.

4.5 Colours

It is the Contractors responsibility to ensure consistent colour coverage. Adequate stocks of material should be delivered to site to complete a specified area at one time. If more than one container of tinted colour is to be used, they shall be secured to guard against possible colour variations. Where large areas are to be coated, pre-mixed factory tinted material must be ordered well in advance of application schedule.

External durability of colour will be assessed as per AS2700. Various colours may not have warrantable external performance and therefore the colour schedule should be referred to Dulux (by the Contractor) prior to application.

Colours shall be selected and shall be specially mixed or milled where necessary by the manufacturer. (No extra will be allowed where colours have to be specially milled).

Provide and keep on the job large colour chips of selected colours. Sample chips will be used for purposes of comparison and colours which do not match the samples will be rejected.

4.6 Execution of Work

<u>Concrete, plaster and masonry substrates:</u>

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Fill indentations with suitable grout or filler and sand smooth. Seal generally or spot seal to ensure that general and localised absorption rates are constant. Remove concrete, grout or mortar splashes. Clean off and remove dust and loose particles. Where porous substrates have dried, dampen if required to prevent excessive absorption. Remove all traces of concrete curing compound residue. Do not apply paint and coatings to cementitious substrates where the pH > 10.

Generally:
Prepare and clean substrates as required to ensure the correct adhesion, finish and durability of the applied work in accordance with accepted industry practice, Product Data and relevant Standards, as applicable, without damage to the substrates or adjacent work. Substrates shall be sufficiently dry and clean, without dust or loose material, previous coatings, oil or other substances harmful to the proper adhesion, quality or durability of the applied work. Rectify non-complying substrates by suitable procedures. Notify any unusual or doubtful substrate conditions to the Superintendent. Coordinate and ensure that substrates by other trades are completed before commencing applied work. Failure to do so may require rectification or replacement of applied work.

Fill cracks, cavities and depressions, and remove projections and high-points.
Substrates for smooth coatings and finishes shall be sanded and sealed to ensure uniformity of the applied work.

Moisture content:
Substrates shall have the required moisture content before installation of applied work.
Carry out moisture testing before commencing to verify correct moisture content.
For non-complying substrates, carry out suitable natural or mechanical drying procedures to accelerate drying or where correct substrate moisture levels cannot otherwise be achieved provide suitable approved permanent moisture sealers or barriers.
Submit details of proposed moisture sealers or barriers. Repeat moisture testing until substrates comply.

PREPARATION OF TIMBER SUBSTRATES
Prepare timber substrates for applied coatings in accordance with the Product Data and relevant Standards to ensure finished work matches Control Samples.
AS 2311 The painting of buildings.
Ensure uniform overall finished appearance.
Establish optimum procedures by practical trials before commencing and record details. Submit Control Samples. Following approval, do not vary procedures for remainder of the work.

Timber substrates:
Timber substrates to be finish coated shall be free of blemishes and defects. Fill open grain, indentations, holes, surface imperfections, and joints, including joints between veneer pieces, with durable, colour matched fillers compatible with coating. Solvent clean any deposits of oil and grease. Fine sand timber substrates before application. Sand smooth after primer or sealer coat and before each subsequent coat. Ensure each coat is cured and hardened before sanding.

Remove all factory applied 'pre-priming' back to bare timber before priming or undercoating. Filled areas, other than filling of open grain, shall be spot-primed and

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sanded before application of undercoat. Knots, pitch streaks and sap spots shall be spot sealed before application of primer. Sand back and seal branding marks. Moisture content of timber shall be less than 15% before first coating application. Paint both sides and all four edges of doors

Painting must not be commenced before the work of all trades has been substantially completed and the area concerned thoroughly cleaned out. Clean conditions shall be maintained during interior decoration. The Contractor must programme the works to meet this requirement.

The Contractor must prepare and neatly maintain proper records, in accordance with AS3894 of Application Conditions of Product Use, and upon completion of the Contractor's work or at such other time as may be directed by the Superintendent, the Contractor shall hand over the files containing such records. These records must include, but not be limited to the following:

- Application conditions
- Coating identifications
- Application data
- For products to protect steel, the Contractor shall record
  - abrasive glass cleaning procedure
  - profile/anchor pattern
  - wet film thickness
  - dry film thickness

Some procedures associated with the surface preparation and paint application are hazardous. Care must be exercised and work carried out in accordance with the appropriate Regulatory Authority legislation. It is the Contractor's responsibility to ensure that all occupational health and safety issues are addressed including eye protection, respirators, noise, handling, welding, confined spaces and ventilation.

3.7 Protection/Unpainted Surfaces

The Contractor must provide protection by masking all surfaces adjacent to the area being coated and removing this protection upon completion of the application. The Contractor shall be responsible for any loss of damage which may be caused to adjacent surfaces or property while the work is being carried out.

The Contractor must provide and lay adequate dust sheets and protect floors and other surfaces, remove all surface hardware, switching plates, light fixtures and the like, before painting and replace in condition as found. Coatings must not be applied in the presence of dust.

The following surfaces shall NOT normally be painted except as specifically noted:

- Copper
- Internal non-ferrous piping
- Stainless Steel

3.8 Paint and Finishing Systems

Painting must be a minimum of 3 coats and sufficient to achieve opacity levels (greater than 3 coats) to the satisfaction of the Superintendent and the Manufacturer.

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Generally:
Paints shall be complete approved coating systems to match Control Samples, suitable for the substrates, intended function and conditions, in accordance with the Product Data and relevant Standards. Submit Product Data and Control Samples. Paints used on concrete, masonry or plaster surfaces shall be 'lime-proof'.

Number of coats:
Provide minimum two top-coats generally in addition to any required primer and under-coats. Provide additional coats if required by Product Data or for appearance. The number of coats shall be increased if required for consistent texture and opacity. Verify scope and extent of work before commencing.

Tinting:
Tinting for each application area shall be prepared in one production batch where practicable, thoroughly mixed to ensure even colour. Colour tinting shall be carried out off-site with accurate equipment. Do not mix tints on-site, unless otherwise approved.

Thinning:
Do not thin, dilute or adulterate proprietary paint products other than where required by the Product Data and otherwise approved.
Where indicated as reduced colour percentage, required colour shall be achieved by adjustment to tinting concentration.

Colour and gloss:
There shall be no colour variation within each application area. The Superintendent may direct a change of gloss level before delivery of paint to site. Colours will be advised before commencing.

TEXTURED COATINGS (ACRYLIC RENDER)
Textured coatings shall be approved proprietary pre-mixed acrylic products to match Control Samples, suitable for the substrates, intended function and conditions, in accordance with the Product Data and relevant Standards. AS/NZS 4548 Guide to long life coatings for concrete and masonry.
Submit Product Data and Control Samples. Textured coatings to external surfaces shall be water and mould resistant. Textured coatings shall be three-coat type with primer coat, build coat and sealer coat, unless otherwise approved.

The Contractor shall note that primary and secondary steelwork must be delivered to Site with protective coatings as defined elsewhere in this Specification.

<u>Interior spaces and areas:</u>
Unless otherwise indicated, paint systems and extent of work shall be as follows:
Generally:-
- Walls - Plasterboard: Not applicable.
- Ceilings - Plasterboard: Not applicable.

Door-frames:
- Door-frames - Aluminium: Not applicable.
- Door-frames - Steel: Gloss acrylic - Primer and two coats.
- Door-frames - Timber: Gloss acrylic - Primer, undercoat and two coats.

Doors:
- Doors - Aluminium: Not applicable.

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- Doors - Not applicable.

Exterior surfaces and fixtures:

Unless otherwise indicated, paint systems and extent of work shall be as follows:

Exterior concrete, masonry and cement rendered walls:-

- Where indicated as painted - Low sheen acrylic - Sealer binder and two coats (UV resistant).
- Where indicated as texture coated - Three coats of proprietary texture (UV resistant).

Exterior door-frames:

- Door-frames - Aluminium: Not applicable.
- Door-frames - Steel: Gloss acrylic - Primer and two coats (UV resistant).
- Door-frames - Timber: Gloss acrylic - Primer, undercoat and two coats (UV resistant).

Exterior doors:

- Doors - Aluminium: Not applicable.
- Doors - Timber flush panel: Gloss acrylic - Primer, undercoat and two coats (UV resistant).

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5. Specification Appendices A - G

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APPENDIX

A

MATERIALS & PRODUCTS SCHEDULE

CONTENTS

05 Roofer 1
06 PAINTING (SITE APPLIED) 2
CONTACT NUMBERS 2
PRODUCT SELECTION 2

Code	Legend	Indicative Location	Detail / Proprietary Description	Rev

BH - Balustrades and handrails

Code	Legend	Indicative Location	Detail / Proprietary Description	Rev
BH-01	Balustrades & Handrails	Ramp	* DESCRIPTION * STANCHION (POST): * Stanchion material: 60mm dia steel CHS 3.6mm wall thickness * Stanchion finish: Galvanised * Stanchion other: * BALUSTRADE (INFILL) * Balustrade material: Chainwire 32mm diamond pattern 3.35mm thick incl PVC * Balustrade finish: PVC coated - colour TBA * Balustrade other: * HANDRAIL: * Handrail material: 48.3mm dia steel CHS 2.3mm wall thickness * Handrail finish: Galvanised * Handrail other: * OTHER: * Fixings: Steel Bracket fixing to wall to comply with AS1428.1	
B	Bollards - Heavy duty	-Disabled car park bays. -Surrounding DB as per Electrical spec.	BOLLARDS - HEAVY DUTY * Manufacturer: Impact Security Products Pty Ltd * Product Ref: SS80B (surface mounted)/SS80R (insitu) * Description: Galvanised bollard, 900mm high with base plate * Finish: Galvanised	
TAC	Tactile Indictors	Refer plans	TACTILE INDICATORS * Manufacturer: TredRight * Product Ref: TredRight PolyPad * Description: Polypad Tactile indicator, R11 rating, Attachment to substrate is permanent with TredRight quick dry epoxy adhesive. PolyPad is to be installed according to TredRight specifications, or by a TredRight accredited installer. To be installed and comply with Australian Standards. * Finish: Plastic, grey(to match existing) *Size: To match existing.	

05 Roofer

Code	Legend	Indicative Location	Detail / Proprietary Description	Rev
RF-01	Roof Cladding (Metal) – Colour 1	Roof and walls	* Metal cladding * Acceptable product: Lysaght * Profile: Klip-Lok 700 * Finish / Coating: Colorbond * Colour: Shale Grey * Colorbond Grade: Standard * Total Coat Thickness: * Base Metal: 0.35mm.	
RF-02	Roof Cladding (Translucent) – Colour 2	Roof and Walls	* Polycarbonate cladding * Acceptable product: Ampelite Wonderglass * Profile: Kliplok 700 * Finish / Coating: polycarbonate GC * Colour: Opal	

GT - Gutters

Code	Legend	Indicative Location	Detail / Proprietary Description	Rev

Code	Legend	Indicative Location	Detail / Proprietary Description	Rev
BG-01	Gutters	General roof area	* Box gutters * Material: sheet metal * Finish: Colorbond * Colour: Shale Grey * Colorbond Grade: Standard * Minimum size: 650 x 150mm * Minimum thicknmess:0.80mm thick * Other:	

06 PAINTING (SITE APPLIED)

PA - Paint (Acrylic)

Code	Legend	Indicative Location	Detail / Proprietary Description	Rev
PA-01	Paint – Protective coating	All exposed Structural steel (excluding purlins). Generally: columns, trusses, rafters, all steel cleats	* Two part Acrylic Polysiloxane * Acceptable product: Interfine 979 Polysiloxane by International Protective Coatings * Type: Acrylic * Gloss level: Gloss * Colour: TBA * Other: Install paint and prepare surface according to manufacturer's recommendations with Interzinc 52 primer (or similar manufacturer approved)	
PA-RD1	Paint – Road marking	Line markings and road safety markings	* Thermo Paint. All paint removal and linemarking to Vic Roads Standards	
CS-01	Shadowclad Coating System	WC-02 EAST ELEVATION	*One coat Boscoat Prime all UV transparent primer containing a fungicide. *Top coat with Boscoat Cladcoat semi-transparent acrylic system. *Colour:TBA * Other: Install system and prepare surface according to manufacturer's recommendations.	

CONTACT NUMBERS

Company	Telephone	Contact	Mobile
International Protective Coatings	03 8336 8444		

PRODUCT SELECTION

The naming of particular products in the Schedules indicates products of acceptable quality and design intent which may be approved, but does not mean exclusive preference for such products. Equivalent products may be used. Submit details of proposed products for approval by the Superintendent before commencing

Code	Legend	Indicative Location	Detail / Proprietary Description	Rev

DOCUMENT STATUS

Date Issued	Issue No	Issued for	Comments	Issued by	Approved By
28-10-2011	B	Tender		PS	PS
6-12-11	C	Tender revision	Changes in RED	MB	MB
19-12-11	D	Tender Revision	Additions in Red	MT	PS

44 Kalman Drive, Boronia VIC 3155
T\ 03 8727 9000
F\ 03 8727 9099
E\ info@sayfa.com.au

ABN 47 631 210 199

Date 29th July 2011.

PROPOSAL NO. 7480

Mr Michael Bouteloup
Paul Morgan Architects
Level 10, 221 Queen Street
MELBOURNE VIC. 3000.

TEL NO: 9605 4100
FAX NO: 9602 5673
EMAIL: michael@paulmorganarchitects.com

Good Afternoon Michael

Indicative Cost Allowance For Supply and Installation Of Roof Access System At

SOUTH MELBOURNE MARKET
YORK STREET, SOUTH MELBOURNE

We thank you for the opportunity to submit this indicative project costing to you.

Along with yourselves, we are committed to improving safety, specialising in permanent access and fall protection systems for workmen working at heights. Sayfa Systems design, manufacture and distribute quality compliant and user friendly systems, installed by accredited installation specialists with whom we will assist in making contact with yourselves.

Based on our assessment of your project, we are pleased to provide you with our suggested solution in accordance with the OH&S regulations and standard industry practice.

Please refer to the scope of works and your system layout plan showing our recommended positioning of your system/componentry.

We are keen to provide the ***Sayfa*** system on this project and will ensure complete product assistance and after sales service to you and your nominated system installer at any stage of your project. Should you want to discuss any alternatives, we would be more than happy to do so.

Yours sincerely,

MICHAEL SOTH
Estimator

PLANNING STAGE PROPOSAL
THIS IS INDICATIVE ONLY.
PRICE AND SCOPE OF WORKS TO BE CONFIRMED AT CONSTRUCTION STAGE.

CR D

COSTING AND SCOPE OF WORKS

This costing covers the indicative supply and installation of the ***Sayfa*** **Designed Roof Access and Fall Protection System** in which we have included the following:

<u>South Melbourne Market</u>

4	x	Sayfa AP130.10	**3SIXTY** Top Mount Fall Arrest Anchor Points
1	x	Sayfa SL200	27.0M **TRAVEL8** Top Mount Static Line System (2 extra Intermediates)
1	x	Sayfa SL200	32.0M **TRAVEL8** Top Mount Static Line System (3 extra Intermediates)
1	x	Sayfa SL200	65.0M **TRAVEL8** Top Mount Static Line System (2 extra Intermediates)
1	x	Sayfa SL1.096	90.0M **TRAVEL8** Top Mount Static Line System
1	x	Sayfa SL1.136	132.0M **TRAVEL8** Top Mount Static Line System
1	x	Sayfa SL200	**TRAVEL8** Top Mount Static Line System >90° Corner
1	x	Sayfa SL227	**PILOT** Horizontal Static Line Shuttle
1	x	Sayfa LD1.135	1.0M **KATT** Mini Access Ladder with Angled Handrails
1	x	Sayfa LD402	**KATT** Ladder Support Bracket
1	x	Sayfa SD975	**SPEKTRA** System Information Signboard

Estimated Price: [redacted]

<u>Recommended Accessories</u>

2	x	Sayfa HR040	**EDGE** Std Harness Kits
1	x	Sayfa HR048	**EDGE** Lockable Harness Equipment Cabinet

Price: [redacted]

SYSTEM DESIGN CRITERIA

System Design

Date	Stage	Project Co-ordinator	Specification		
			Written	Drawn	By
29/07/11	☑ Planning	Paul Morgan Architect	☐	☑	Sayfa Systems

Based on:

☑ Standard industry practice based on Drawing No: CD.A220 Rev. B
☐ Documented system layout as shown on Drawing No: Rev.
☐ Defined specification by building designer based on Drawing No: Rev.
☐ To be confirmed with System Designer

Compliant with relevant Australian Standards ☑ YES
☐ NO – see details below

Roof Access

Roof access required via:

☐ Existing roof access in place
☐ Existing roof access in place but needs upgrading
☑ Ladder Support Bracket for use with portable ladders
☐ Fixed cage protected access ladder(s)
☐ Fixed fall arrest line access ladder(s)
☑ Fixed mini access ladder(s)
☐ Fixed access ladder leading to roof hatch. Note: Roof access hatch by others.
☐ Fold down ladder with internal ceiling access and roof hatch. Note: Roof access hatch by others.
☐ To be confirmed with System Designer
☐ Other

Fall Protection

Roof fall protection provided to cover:

☑ All fall edges in excess of 2.0M high
☐ Unprotected gutter edges only
☑ Roof mounted plant/equipment
☐ Skylights
☐ Gutter and general roof maintenance access
☐ To be confirmed with System Designer
☐ Other

Using the following componentry:

☐ Guardrail
☐ Fibre Walkway
☐ Aluminium Walkway
☑ Anchorage points
☑ Static lines
☐ Flat skylight protectors
☐ Raised skylight protectors

PROJECT NOTES

GENERAL NOTES:

- All prices exclude GST.
- This is an indicative design layout only and will need to be confirmed at time of order by the nominated system installer.
- Prices(s) are subject to a site inspection by the nominated system installer at time of installation.
- Any changes to be made to the original indicative design may result in a variation to this indicative costing allowance.
- System layouts have been based on architectural roof plans which do not always show proposed hydraulic and mechanical layouts. The system layout and componentry selection may need to be altered which may result in a variation to this proposal.
- Based on current regulations, Sayfa Systems recommends fall protection to all fall edges exceeding 2.0M in height.
- Worksafe classifies skylights as fall hazards, therefore the investment of skylight protectors is strongly recommended by Sayfa Systems.
- On completion of the system installation, a user manual will be provided for your information and ongoing system usage.

PROPOSAL VALIDITY:	90 days
INSTALLATION LEAD TIME:	To be confirmed with nominated system installer.
PAYMENT TERMS:	To be confirmed with nominated system installer.

DATE: 29/07/2011

ROOF ACCESS & FALL PROTECTION SPECIFICATION

Project Name:	**South Melbourne Market**
System Design Ref. No:	**7480**
Design Co-Ordinator:	**Michael Soth**
Tel No:	**03 8727 9000**
Email:	**projects@sayfa.com.au**

GENERAL NOTES

Supply and install proprietary Roof Access, Fall Protection (and Abseil Systems), in accordance with Sayfa Systems installation guidelines (System Design Ref. No. 7480).

Exact component locations, support structure integrity, suitability and fixing method to be assessed and determined by a competent person prior to commencement of system installation.

SCHEDULE OF COMPONENTS

4	x	Sayfa AP130.10	**3SIXTY** Top Mount Fall Arrest Anchor Points
1	x	Sayfa SL200	27.0M **TRAVEL8** Top Mount Static Line System (2 extra Intermediates)
1	x	Sayfa SL200	32.0M **TRAVEL8** Top Mount Static Line System (3 extra Intermediates)
1	x	Sayfa SL200	65.0M **TRAVEL8** Top Mount Static Line System (2 extra Intermediates)
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1	x	Sayfa SL1.136	132.0M **TRAVEL8** Top Mount Static Line System
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1	x	Sayfa SL227	**PILOT** Horizontal Static Line Shuttle
1	x	Sayfa LD1.135	1.0M **KATT** Mini Access Ladder with Angled Handrails
1	x	Sayfa LD402	**KATT** Ladder Support Bracket
1	x	Sayfa SD975	**SPEKTRA** System Information Signboard

Recommended Accessories

2	x	Sayfa HR040	**EDGE** Std Harness Kits
1	x	Sayfa HR048	**EDGE** Lockable Harness Equipment Cabinet

SYSTEM DESIGN CRITERIA

System Design

Date	Stage	Project Co-ordinator	Specification		
			Written	Drawn	By
29/07/11	☑ Planning	Paul Morgan Architect	☐	☑	Sayfa Systems

Based on:

☑ Standard industry practice based on Drawing No: CD.A220 Rev. B
☐ Documented system layout as shown on Drawing No: Rev.
☐ Defined specification by building designer based on Drawing No: Rev.
☐ To be confirmed with System Designer

Compliant with relevant Australian Standards ☑ YES
☐ NO – see details below

Roof Access

Roof access required via:

☐ Existing roof access in place
☐ Existing roof access in place but needs upgrading
☑ Ladder Support Bracket for use with portable ladders
☐ Fixed cage protected access ladder(s)
☐ Fixed fall arrest line access ladder(s)
☑ Fixed mini access ladder(s)
☐ Fixed access ladder leading to roof hatch. Note: Roof access hatch by others.
☐ Fold down ladder with internal ceiling access and roof hatch
☐ To be confirmed with System Designer
☐ Other

Fall Protection

Roof fall protection provided to cover:

☑ All fall edges in excess of 2.0M high
☐ Unprotected gutter edges only
☑ Roof mounted plant/equipment
☐ Skylights
☐ Gutter and general roof maintenance access
☐ To be confirmed with System Designer
☐ Other

Using the following componentry:

☐ Guardrail
☐ Fibre Walkway
☐ Aluminium Walkway
☑ Anchorage points
☑ Static lines
☐ Flat skylight protectors
☐ Raised skylight protectors

STANDARDS

Supply and installation of proprietary Access and Fall Protection System to comply generally in accordance with the following:

AS/NZS1891.1:2009	Industrial fall arrest systems and devices/harnesses and ancillary equipment
AS/NZS1891.2:2001	Industrial fall arrest systems and devices/horizontal lifeline & rail systems
AS/NZS1891.3:1997	Industrial fall arrest systems and devices/fall arrest devices
AS/NZS1891.4:2009	Industrial fall arrest systems and devices/selection, use and maintenance
AS1657:1992	Fixed platforms, walkways, stairways and ladders/design, construction, installation

INSTALLATION

Installation of Roof Access, Fall Protection and Abseil Systems must be carried out by an **Accredited Sayfa Installer** compliant with relevant Australian Standards and WorkCover Codes of Practice/Guidelines and OH & S Legislation. The **Accredited Sayfa Installer** must have current Sayfa Accreditation Certificate and the relevant insurance protection.

Note: Any changes made to the original system design must be authorised by Sayfa Systems – Design Department prior to commencement of the system installation.

CERTIFICATION

On completion of installation, certification must be carried out by an **Accredited Sayfa Installer** in accordance with Sayfa's installation guidelines.

A Handover Manual must be provided on completion of installation including:

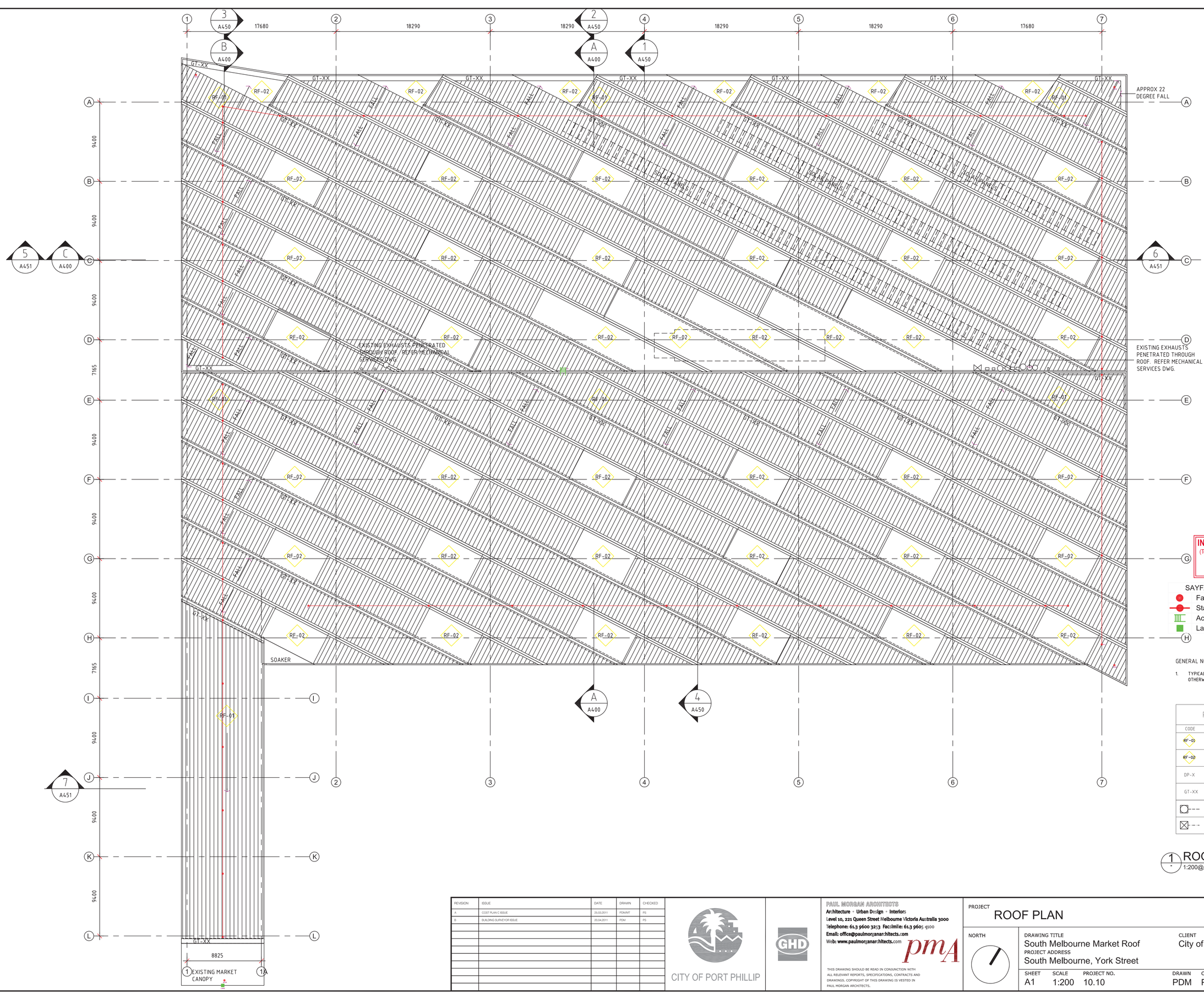
- Product Specifications
- System Layout Plan – showing positioning of all Roof Access / Fall Protection equipment installed
- Certificate – stating installed system is safe to be used
- Detailed description of safe operation of the installed system
- Annual Recertification Schedule
- Product Warranties
- Working at Heights Management Template

MAINTENANCE

All Fall Arrest Systems and equipment require periodical maintenance by competent personnel in accordance with Sayfa's specifications and requirements of Australian Standard AS/NZS1891.4:2009 [Section 9].

MANUFACTURED & DISTRIBUTED BY:

Sayfa Systems
T/1300 301 755
F/1300 881 092
E/projects@sayfa.com.au
W/www.sayfa.com.au



GENERAL NOTES:

1. TYPICAL ROOF ANGLE TO BE APPROX. 25 DEGREES UNLESS OTHERWISE STATED.

ROOF PLAN LEGEND

CODE	DESCRIPTION
RF-01	LYSAGHT CUSTOM ORB ZINCALUME
RF-02	"AMPELITE" CORRUGATED SHEETING COLOUR TO BE SPECIFIED
DP-X	DOWNPIPE- TO BE DESIGNED BY SIPHONIC CONSULTANT
GT-XX	BOX GUTTER -TO BE DESIGNED BY SIPHONIC CONSULTANT
	SYPHON GUTTER INLET
	SYPHON GUTTER OVERFLOW

1 ROOF PLAN
1:200@A1

REVISION	ISSUE	DATE	DRAWN	CHECKED
A	COST PLAN C ISSUE	25.03.2011	PDM/MT	PS
B	BUILDING SURVEYOR ISSUE	20.04.2011	PDM	PS

CITY OF PORT PHILLIP

GHD

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pmA

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PROJECT
ROOF PLAN

NORTH

DRAWING TITLE
South Melbourne Market Roof
PROJECT ADDRESS
South Melbourne, York Street

CLIENT
City of Port Phillip

SHEET	SCALE	PROJECT NO.	DRAWN	CHECKED	DRAWING NO.	REVISION
A1	1:200	10.10	PDM	PS	CD_A220	B

EVZ SYFON SYSTEMS

ABN 90 106 706 745

22 Hargreaves Street Huntingdale
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F. +61 3 9542 6099
syfon@syfon.com
www.syfon.com

12/04/2011

Ref: A4530/7

Paulo Sampaio
Paul Morgan Architects Pty Ltd
Level 10, 221 Queen Street
Melbourne Victoria Australia 3000

Via Email: melissa@paulmorganarchitects.com
Phone Number: 03 9605 4105

Re: South Melbourne Market
Budget Price - Syfonic Roof Drainage

As a result of recent discussions and information received concerning the provision of a High Level Syfonic Roof Drainage System to the above Project we now take pleasure in providing our budget price for the works as follows:

Design, supply, install and test a Syfonic Roof Drainage System in high density polyethylene pipe, comprising Syfon Systems inlets and main high level drainage pipes running within the building to the downpipes as described on the drawings listed below, which terminate at a tank (by others) around the building.

Please note the following:

1. DESIGN

(i) Our price is based on the following information.

- Drawings
  - Syfon Systems Drawing: A4530-SK01A, A4530-SK02A
- Roof Design

  The design is based on the distribution of catchments, gutter falls, Flat (flowover) Expansion Joints and overflows to locations all to be shown on our drawing.

2. INLETS

(i) All inlets will be Syfon Systems Flanged Type. Leaf guards and baffles will be supplied with the gutter/roof inlets and Stainless Steel trays and grates will be supplied for concrete decks.

(ii) We have only allowed to supply all the inlets. Installation to the gutter is by the roofer to our drawing detail.

3. PIPEWORK AND DOWNPIPES

(i) Provision has been included to compensate for the expansion of the HDPE pipework and to minimise sinuous pipe runs by utilising the Syfon Systems support method.

(ii) This budget price includes for the securing of downpipes to Internal/External building cladding or building structure, however no provision has been made for cutting or forming holes or filling/repairing gaps to the building cladding or structure that may be required for the completion of the works.

(iii) Allowance has been made to terminate our downpipes at an inground tank with sufficient overflow relief (all by others) adjacent to or within the building at this stage

(iv) We have provided an extra over price for syfonic overflow for the project inclusive of vermin protection.

(v) All pipework to be High Density Polyethylene.

(vi) We have excluded all excavation, bedding and backfill.

4. RAINFALL INTENSITY

(i) Our calculations allow for a design rainfall intensity of:

186 mm/hour (i.e. 1 in 100 years) box gutters

5. TERMS AND CONDITIONS

(i) This budget price is offered on the basis of our Standard Terms and Conditions of Trade.

6. BUDGET PRICE

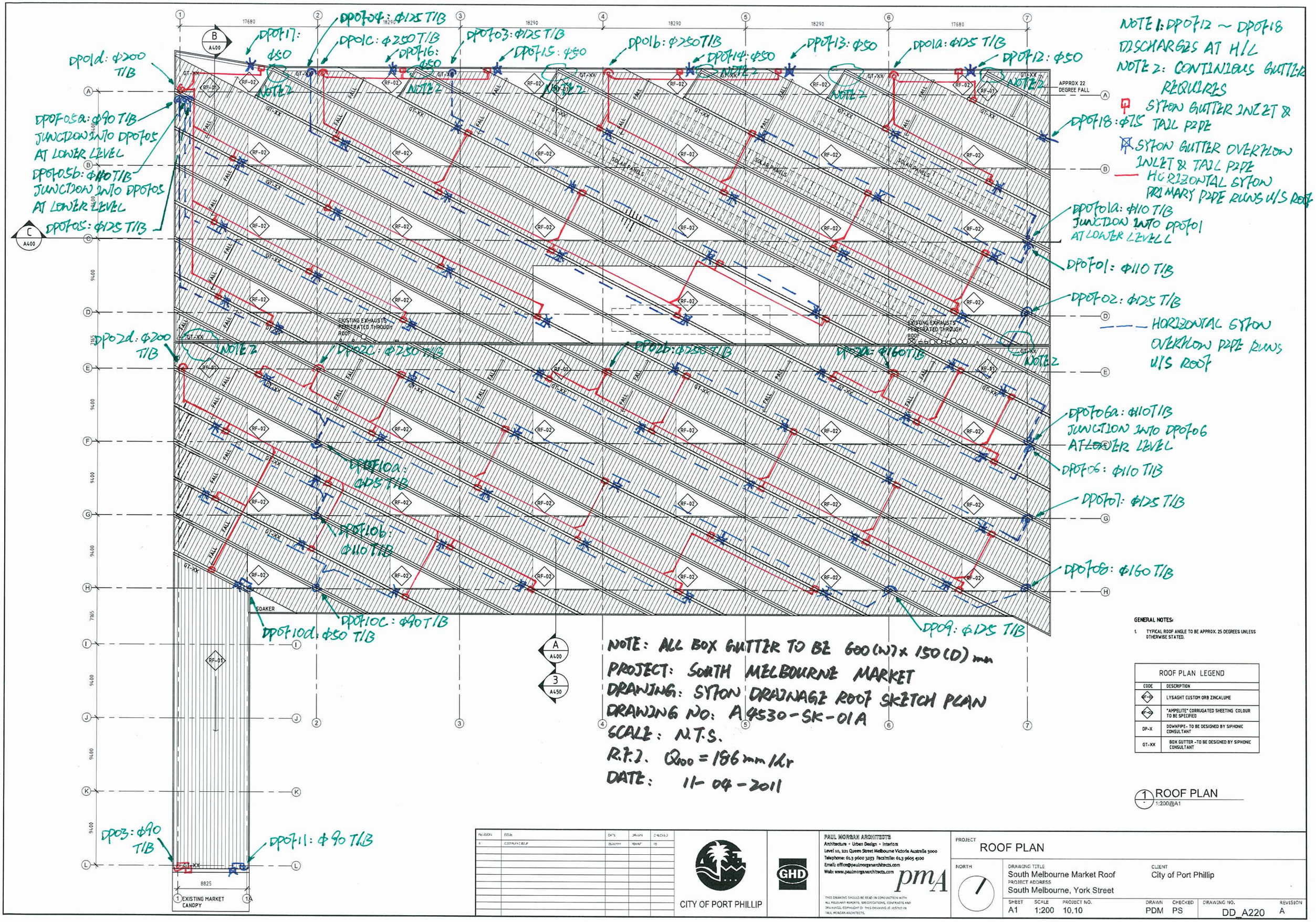
For the budget price of:

(Our payment terms are 30 days based on the "Building and Construction Industry Security of Payment Act 2002")

We believe that we have included all the necessary information that you require to progress this proposal. In the event that you require any further information, please do not hesitate to contact the undersigned.

Yours faithfully,
SYFON SYSTEMS

LACHLAN T. NUNN



GENERAL NOTES:

1. TYPICAL ROOF ANGLE TO BE APPROX. 25 DEGREES UNLESS OTHERWISE STATED.

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GT-XX	BOX GUTTER - TO BE DESIGNED BY SIPHONIC CONSULTANT

1 ROOF PLAN
1:200@A1

REVISION	ISSUE	DATE	DRAWN	CHECKED
A	CONCEPT PLANNING	25/07/11	PDM	PS

CITY OF PORT PHILLIP

GHD

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PROJECT: ROOF PLAN

NORTH

DRAWING TITLE: South Melbourne Market Roof
PROJECT ADDRESS: South Melbourne, York Street
CLIENT: City of Port Phillip

SHEET	SCALE	PROJECT NO.	DRAWN	CHECKED	DRAWING NO.	REVISION
A1	1:200	10.10	PDM	PS	DD_A220	A

DP01/04: Φ125 F/A 30l/s DISCHARGES INTO ATMOSPHERE AT H/C

DP01/03: Φ125 F/A 30l/s DISCHARGES INTO ATMOSPHERE AT H/C

DP01/05: Φ160 F/A 52l/s DISCHARGES INTO ATMOSPHERE AT H/C

DP01c: Φ250 F/A

DP01b: Φ250 F/A

DP01a: Φ125 F/A

DP01d: Φ200 F/A

DP01: Φ315 206l/s DISCHARGES INTO TANK

HORIZONTAL SYTON PIPE RUNS AT H/C Φ160

DP01/01: Φ125 F/A 37l/s DISCHARGES INTO ATMOSPHERE AT H/C

DP01/02: Φ125 F/A 31l/s DISCHARGES INTO ATMOSPHERE AT H/C

DP02: Φ315 202l/s DISCHARGES INTO TANK

HORIZONTAL SYTON PIPE RUNS AT H/C Φ160

DP02c: Φ250 F/A

DP02b: Φ250 F/A

DP02a: Φ160 F/A

DP02d: Φ200 F/A

DP01/10a: Φ125 F/A

DP01/06: Φ125 F/A 37l/s DISCHARGES INTO ATMOSPHERE AT H/C

DP01/07: Φ125 F/A 31l/s DISCHARGES INTO ATMOSPHERE AT H/C

DP01/10b: Φ110 F/A

DP01/10d: Φ50 F/A

DP01/10c: Φ110 F/A

DP01/09: Φ125 33l/s DISCHARGES INTO ATMOSPHERE AT H/C

DP01/10: Φ160 T/B DISCHARGES INTO ATMOSPHERE

DP01/08: Φ160 F/A 36l/s DISCHARGES INTO ATMOSPHERE AT H/C

DP03: Φ90 F/A 20l/s DISCHARGES INTO TURN-UP

DP01/11: Φ90 F/A 20l/s DISCHARGES INTO ATMOSPHERE

YORK STREET

CECIL STREET

COVENTRY STREET

EXISTING BUILDING

PROJECT: SOUTH MELBOURNE MARKET

DRAWING: SYTON DRAINAGE GROUND LEVEL SKETCH PLAN

DRAWING NO: A4530-SK-024

SCALE: N.T.S.

R.T.2. Q_{100} = 186mm/hr

DATE: 11-04-2011

PLANS GENERAL NOTES:

1. SELF LEVELLING SCREED PLACED ON CARPARK DECKS WITH 150MM FALL TOWARDS EXISTING CENTRAL BOX GUTTER
   NORTH DECK RL - RL.013.475
   SOUTH DECK RL - RL.014.215
2. NEW CARPARK LINE MARKINGS THROUGHOUT

PLAN LEGEND

CODE	DESCRIPTION
	GRATED PIT
FH	FIRE HYDRANT
TM	TICKET MACHINE
LP	LIGHT POST
PS	PARKING SIGN
GV	GAS VALVE
	TACTILES
EJ	EXPANSION JOINT
SH	SPEED HUMP

1 PROPOSED PLAN
1:200@A1

REVISION	ISSUE	DATE	DRAWN	CHECKED
A	PRELIMINARY	14.09.2011	PDM	PS
B	PLANNING PERMIT COMMENTS	21.10.2011	PDM	PS
C	COST PLAN 2 ISSUE	25.10.2011	PDM	PS

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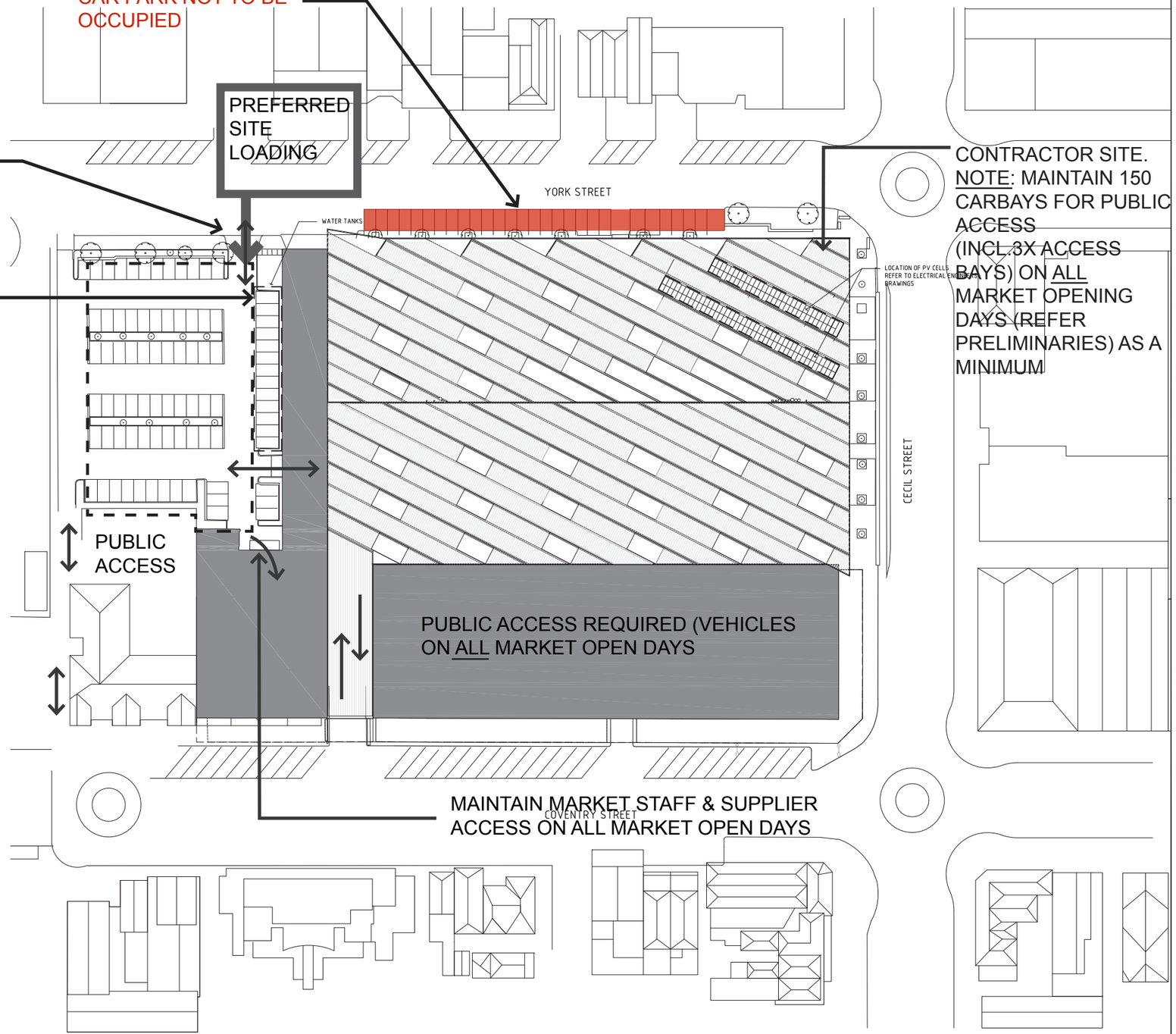
SHEET	SCALE	PROJECT NO.	DRAWN	CHECKED	DRAWING NO.	REVISION
A1	1:200	10.10	PDM	PS	DD_A201	C

CITY OF PORT PHILLIP
SOUTH MELBOURNE MARKET ROOF


CAR PARK NOT TO BE OCCUPIED
PREFERRED SITE LOADING
PUBLIC ACCESS REQUIRED (VEHICLES) ON ALL MARKET OPEN DAYS.
13 BAYS AVAILABLE FOR CONTRACTOR USE; MAINTAIN PUBLIC & MARKET ACCESS TO CAR PARK ON ALL MARKET OPEN DAYS.
MAINTAIN ALL TRAFFIC FLOW ON SURROUNDING STREETS ON ALL MARKET OPEN DAYS
CONTRACTOR SITE. NOTE: MAINTAIN 150 CARBAYS FOR PUBLIC ACCESS (INCL 3X ACCESS BAYS) ON ALL MARKET OPENING DAYS (REFER PRELIMINARIES) AS A MINIMUM
YORK STREET
WATER TANKS
LOCATION OF PV CELLS REFER TO ELECTRICAL ENGINEERS DRAWINGS
CECIL STREET
PUBLIC ACCESS
PUBLIC ACCESS REQUIRED (VEHICLES ON ALL MARKET OPEN DAYS
MAINTAIN MARKET STAFF & SUPPLIER ACCESS ON ALL MARKET OPEN DAYS
COVENTRY STREET

1 - LOCATION PLAN
1:500 @ A1

APPENDIX PURSUANT TO CLAUSE 24 SITE: CONTRACTOR'S SITE EXTENTS.

REVISION	ISSUE	DATE	DRAWN	CHECKED
A	COST PLAN C ISSUE	25/01/2011	PDM/MT	PS
B	BUILDING SURVEYOR ISSUE	25/04/2011	PDM	PS

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PROJECT
COVER SHEET AND LOCATION PLAN

NORTH

DRAWING TITLE
South Melbourne Market Roof
PROJECT ADDRESS
South Melbourne, York Street

CLIENT
City of Port Phillip

SHEET	SCALE	PROJECT NO.	DRAWN	CHECKED	DRAWING NO.	REVISION
A1	1:500	10.10	PDM	PS	CD_A000	C

jta risk management
health safety + environment solutions

December 2010

CITY OF PORT PHILLIP

ASBESTOS AUDIT REVIEW

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Appendix II – Certificates of Analysis
Appendix III – Photographs
Appendix IV – Asbestos Registers

Client: City of Port Phillip

Job No: J0871

Performed By: Aaron Zanussi, Occupational Hygienist

Reviewed By: Andrew Stewart, Senior Occupational Hygienist

N:\Clients\CityofPortPhillip\J0871 - Asbestos Audits 2010\Audit Report\City of Port Phillip D5 Audit Report.doc

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+ OHS Compliance Audits
+ Noise Equipment Hire
+ OHS Procedures
+ Manual Handling
+ OHS Training
+ Asbestos Risk Assessments
+ On-Site Audiometric Testing
+ OHS Management Systems
+ Hazardous Substances
+ Noise Assessments

SUMMARY

During August 2010 – November 2010, JTA Risk Management performed an Asbestos Audit Review of nominated City of Port Phillip buildings.

The Asbestos Audit Review has been performed in accordance with the requirements of Part 4.3, Division 5 of the Victorian Occupational Health and Safety Regulations 2007.

This Asbestos Audit incorporated:

- A site inspection to confirm, as far as practicable, the location and condition of asbestos containing materials identified in the existing asbestos registers previously compiled by JTA Risk Management.
- A site inspection and the identification, as far as practicable, of the location and type of asbestos containing materials within buildings with no existing asbestos registers.
- An assessment of the friability and condition of identified asbestos containing materials.
- Labelling of selected asbestos containing materials.
- Compilation of Asbestos Registers.
- Provision of information to assist in complying with the relevant requirements of Part 4.3 of the Victorian Occupational Health and Safety Regulations 2007.

An Asbestos Register for each building has been prepared and are included as Appendix IV of the Asbestos Audit Review report.

All identified or suspected asbestos containing materials were found to be in reasonable condition and are not considered to represent an asbestos exposure risk to building occupants while not subject to physical disturbance. Accordingly, removal, enclosure or sealing is not currently required, provided that the materials are left undisturbed and maintained in their current condition.

While no current asbestos exposure risk was identified, to minimise any future potential asbestos exposure risk as far as is practicable, removal of the following asbestos materials is recommended:

- Building Asset ID LIB238 – Emerald Hill Library, 195-207 Bank St, South Melbourne - Meterboard cabinet – Millboard lining debris.
- Building Asset ID S&R162 – Elwood Angling Club, 3 Elwood Foreshore, Elwood - Disused asbestos cement gutters stored above toilet/showers.
- Building Asset ID S&R383 – Port Melbourne Football Club – Main Scoreboard, 525 Williamstown Road, Port Melbourne - South side ground asbestos cement debris.
- Building Asset ID OPS502 – South Melbourne Town Hall, 208 Bank Street, South Melbourne - Disused asbestos cement flue - west side of ceiling space & asbestos cement debris - ceiling space near roof access door.

Refer to Appendix III for photos of the above materials.

Additional information and recommendations to assist in complying with the relevant requirements of Part 4.3 of the Victorian Occupational Health and Safety Regulations 2007 are included in the report.

1 INTRODUCTION

During August 2010 – November 2010, JTA Risk Management performed an Asbestos Audit Review of nominated City of Port Phillip buildings. The audit review was commissioned by Jim McClean of the City of Port Phillip.

The Asbestos Audit Review has been performed in accordance with the requirements of Part 4.3, Division 5 of the Victorian Occupational Health and Safety Regulations 2007.

This Asbestos Audit Review incorporated:

- A site inspection to confirm, as far as practicable, the location and condition of asbestos containing materials identified in the existing asbestos registers previously compiled by JTA Risk Management.
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- An assessment of the friability and condition of identified asbestos containing materials.
- Labelling of selected asbestos containing materials.
- Compilation of Asbestos Registers.
- Provision of information to assist in complying with the relevant requirements of Part 4.3 of the Victorian Occupational Health and Safety Regulations 2007.

A list of all buildings included in the Asbestos Audit, sorted by building asset ID, is presented in Appendix I.

Disclaimer: JTA Risk Management has prepared this report exclusively for the use of the named client. JTA believe that the information in this report is correct, and that any opinions, conclusions or recommendations are reasonably held or made at the time of writing. However, JTA do not warrant their accuracy, and disclaim all responsibility for any loss or damage which may be suffered by any person, directly or indirectly from the use of this report. This report shall be read in its entirety and shall only be reproduced in full.

2 METHODOLOGY

The site inspection involved a visual inspection of accessible areas, rooms and surfaces throughout the building(s). The site inspection was restricted to areas / materials that:

- were accessible without contravention of relevant legislation or Codes of Practice.
- were accessible without significant demolition of finishes or structures.
- did not pose a safety risk from operational plant or electrocution.
- were readily accessible via a ladder and/or did not pose a height safety risk.
- did not require dismantling of equipment.
- were not disruptive to the normal operations of the building.
- were considered practicable to assess.

Direct visual inspections were conducted where practicable.

Inspection for materials in cavities, hidden under or behind other surfaces or coverings was only carried out where there was a significant probability of asbestos containing materials being present, and where the inspection could be conducted safety and without significant visible damage.

This Asbestos Audit Review did not include the identification of other hazardous building materials or dangerous goods / hazardous substances used, stored or manufactured within the buildings.

The presence and extent of asbestos materials has been determined from a combination of representative sampling and inspection, and professional judgement based on the materials age and appearance. Materials of similar appearance and nature have been assumed to have a similar asbestos content.

Where required, analysis of materials suspected of containing asbestos was carried out by an independent NATA accredited laboratory. Certificates of analysis of samples are presented in Appendix II. Samples referred to from previous reports were collected and sent off for analysis by JTA Risk Management during previous audits.

During the site inspections, asbestos warning labels were fixed, where practicable, to the following asbestos containing materials:

- friable materials
- electrical switchboards
- fire doors
- redundant materials

Where previous labelling had been removed or dislodged, new labels were fixed.

3 ASBESTOS REGISTERS

An Asbestos Register for each building has been prepared and are included as Appendix IV of this report.

The type and location of individual asbestos materials and audit date is provided in the Asbestos Register.

When asbestos materials have been found to be in poor condition, their condition has been noted within the asbestos register. When found in good condition, not requiring any remedial attention, the condition of the asbestos material has not been commented on in the asbestos register.

Friable asbestos materials have been noted within the register. Where not noted, asbestos containing materials are non friable.

Photographs of selected asbestos containing materials considered to require attention to minimise any future potential asbestos exposure risk as far as is practicable are presented as photos in Appendix III.

4 RISK ASSESSMENT / RECOMMENDATIONS

The following information and recommendations are provided to assist in minimising risks associated with the identified or suspected asbestos containing materials, and in complying with relevant requirements of Part 4.3 of the Victorian Occupational Health and Safety Regulations 2007. Information regarding all regulatory requirements are not included, and it is recommended that the person who manages or controls the workplace is familiar with the relevant sections of the Regulations to ensure that they are fully aware of their obligations.

4.1 Risk Assessment & Control

For the purpose of this report, Asbestos Exposure Risk has been defined as the "likelihood of exposure to airborne asbestos fibre exceeding one half of the exposure standard of 0.1 fibres/ml".

In assessing the asbestos exposure risk associated with the identified or suspected asbestos containing materials, the following factors have been considered:

- location.
- friability.
- condition.
- potential for future disturbance.
- asbestos content.

The identified or suspected asbestos containing materials were found to be in reasonable condition and are not considered to represent an asbestos exposure risk to building occupants while not subject to physical disturbance. Accordingly, removal, enclosure or sealing is not currently required, provided that the materials are left undisturbed and maintained in their current condition.

While no current asbestos exposure risk was identified, to minimise any future potential asbestos exposure risk as far as is practicable, removal of the following asbestos materials is recommended:

- Building Asset ID LIB238 – Emerald Hill Library, 195-207 Bank St, South Melbourne - Meterboard cabinet – Millboard lining debris.
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- Building Asset ID OPS502 – South Melbourne Town Hall, 208 Bank Street, South Melbourne - Disused asbestos cement flue - west side of ceiling space & asbestos cement debris - ceiling space near roof access door.

Refer to Appendix III for photos of the above materials.

4.2 Inaccessible Areas

While every practicable effort has been made to identify all asbestos containing materials, additional materials may be present in areas that were inaccessible during the site inspection. Such areas may include, but are not limited to: ceiling spaces, underfloor areas, enclosed wall cavities, under floor coverings, inside plant and equipment.

Inaccessible areas that are considered likely to contain asbestos containing materials have been highlighted in the Asbestos Register. Other inaccessible areas may also contain asbestos containing materials.

A further assessment of currently inaccessible areas should be performed if such areas are likely to be accessed or affected by any future works.

Building Asset ID	ADDRESS	SUBURB	DESCRIPTION	APPROX AREA	AGE
Aged Facilities					
AGE304	179-197 Napier Street	South Melbourne	Napier Street Hostel	2300	1880
Art Facilities					
ART001	26 Acland Street	St Kilda	Linden Art Gallery	882	1880
ART220	11 Shakespeare Grove	St Kilda	St Kilda Bowling Club Artists Studio, - Formerly: City Of St Kilda Bowling Club / St Kilda Community Garden Pavillion	648	1988
ART289	1-35 Graham Street	Albert Park	Gasworks -Bldg 1 Sculpture Studio	312	1940
ART290	1-35 Graham Street	Albert Park	Gasworks -Bldg 2 Arts & Crafts	105	1940
ART291	1-35 Graham Street	Albert Park	Gasworks -Bldg 3 Ceramics Studio	110	1940
ART292	1-35 Graham Street	Albert Park	Gasworks -Bldg 4 Textile Studios *3	250	1940
ART293	1-35 Graham Street	Albert Park	Gasworks -Bldg 5 Gatehouse Building	205	1940
ART294	1-35 Graham Street	Albert Park	Gasworks -Bldg 6 Anthill Office/ café	336	1940
ART295	1-35 Graham Street	Albert Park	Gasworks -Bldg 7 Theatre Hall & New Area	383	1940
ART296	1-35 Graham Street	Albert Park	Gasworks -Bldg 9 Office	98	1940/2004
ART297	1-35 Graham Street	Albert Park	Gasworks -Bldg 11 Red Brick	223	1940
ART298	147 Liardet Street	Port Melbourne	Regional Aars Dep't(Old Port Melb Library)- Gas Works bldg 10 dark room (above Coles)	24	1940
ART541	1-35 Graham Street	Albert Park	Gasworks -Public Toilet	44	1940
Children's Services					
CHS008	71-79 Argyle Street	St Kilda	North St Kilda Child Care Centre	506	1986
CHS105	51 Broadway	Elwood	Elwood Maternal & Child Health Centre (formerly: Burnett Gray Child Welfare Centre)		1952
CHS160	17 Eildon Road	St Kilda	Eildon Road Children's Centre (Formerly: West St Kilda Child Care Centre)	423	1925
CHS219	31B Scott Street	Elwood	Scott Street Child Care Centre	242	1930
CHS222	46 Tennyson Street	Elwood	Elwood Children's Centre	325	1920
CHS224	39 The Avenue	Balaclava	The Avenue Child Care Centre	270	1880/1990
CHS234	8 York Street	St Kilda	York Street Kindergarten and Occasional Care (Formerly: West St Kilda Kindergarten & West St Kilda Maternal &Child Health Centre)	195	1970
CHS257	5-11 Carter Street	Albert Park	South Melbourne Child Care Cooperative formerly: Carter Street Neighbourhood House (No Longer Managed by Council)	317	1985/1993
CHS280	18 Dundas Place	Albert Park	Albert Park Preschool Centre, Albert Park Dental Clinic, & Albert Park Maternal & Child Health Centre	see comments	1940
CHS283	97 Eastern Road	South Melbourne	Lillian Cannam Kindergarten	345.4	1929
CHS330	106 Clark Street	Port Melbourne	Clark Street Child Care Centre	500	1970
CHS331	7 Cumberland Road	Port Melbourne	Ada Mary A'Bechett Children's Centre & Garden City Maternal &Child Health Centre	615.6	1970
CHS510	171 Chapel Street	St Kilda	St Kilda Children's Centre & Maternal &Child Health Centre	839	1971

Building Asset ID	ADDRESS	SUBURB	DESCRIPTION	APPROX AREA	AGE
CHS511	400 Clarendon Street	South Melbourne	Chiropractic Clinic (note this is Crown land - the Clinic section is under 15 year lease that expires 1/12/06	567.38	1920
CHS511	404-412 Clarendon Street	South Melbourne	Clarendon Street Children's Centre Cooperative	567.38	1920
			Commercial Facilities		
CML168	15 Elwood Foreshore	Elwood	Food Preparation Building	48	1971/1994
CML179	6 Jacka Boulevard	St Kilda	Kiosk	53	1989
CML182	26 Jacka Boulevard	St Kilda	Kiosk	22	1987
CML183	30 Jacka Boulevard	St Kilda	Stokehouse Restaurant	926	1930/1995
CML195	42-54A Marine Pde	St Kilda	St Kilda Marina - Workshop	237	1969
CML208	29A Ormond Esplanade	Elwood	Elwood Kiosk	17	1950
CML254	175B Beaconsfield Parade, Opp Mills Street	Middle Park	Sand Bar & Change Rooms	244	1982
CML254	Beaconsfield Pde (at Le Kiosk)	South Melbourne	Brick & Painted Rendered Brick		1982
CML256	129 Beaconsfield Parade	Albert Park	Kerferds Restaurant (exterior)	130	1940/1990
CML348	174 Nott Street	Port Melbourne	Liquor Store	367	1940 1930
CML384-393	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:22 Glass House & Seeding Shed	105	1940
CML384-393	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:23 Glass House & Seeding Shed	45	1940
CML384-393	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:25 Potting Shed	90	1940
CML384-393	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:27 Turf Shed	21	1940
CML384-393	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:29 Garden Shed	50	1940
CML384-393	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:31 Shade House	320	1940
CML518	42 Jacka Boulevard-Donovans Restaurant	St Kilda	Bathing Pavillion & WC (Concrete panels & rendered concrete, painted)	102	1928/1995
CML518	38-40 Jacka Boulevard	St Kilda	Donovan's Restaurant	543	1928/1995
Demolished	150-200 Dandenong Road	Balaclava	Alma Park - Storage Block/Toilet	31	1950
Demolished	225A-B Beaconsfield Parade, Opp Armstrong Street	Middle Park	Middle Park Life Saving Clubrooms	208	1980
Demolished	225A-B Beaconsfield Parade, Opp Armstrong Street	Middle Park	Kiosk WC's & Change Rooms	268	1980
Demolished	White Reserve, The Boulevard - Port Melbourne	Port Melbourne	Smooth besser bricks, unpainted		1970
Demolished	225A-B Beaconsfield Parade, Opp Armstrong Street	South Melbourne	Middle Park Life Saving -Bluestone Toilet		1980
Demolished	70 White Street	South Melbourne	DJ's Dinner(Shop)	87	1950
Demolished	56-78 White Street	South Melbourne	South Melbourne Transfer Station- Glasshouse	2	1930
Demolished	8 Jacka Boulevard	St Kilda	Pier Entry Shed / St Kilda Pier Entry- Shelter	91	1987

Building Asset ID	ADDRESS	SUBURB	DESCRIPTION	APPROX AREA	AGE
Demolished	331A Beaconsfield Parade	St Kilda	Surf Life Saving Victoria	528	1962
Demolished	20 Jacka Boulevard	St Kilda	Kiosk	31	1987
Demolished	36 Jacka Boulevard	St Kilda	Kiosk	72	1928/1995
			Community Centres		
CCE005	200 Alma Rd	St Kilda	Alma Road Community House & Maternal & Child Health Centre (House - Brick Multifronted) also the public toilet at this address to be done.	230	1930
CCE006	67-69 Argyle Street	St Kilda	Betty Day Centre(Senior Citizens Club) - (Regional Meals Kitchen-This is the office location of the Council Meals Service-entrance is via Bath Street)	see comments	1986
CCE092	38-40 Blessington Street	St Kilda	Cora Graves Centre	312	1890 -1904
CCE093	55A Blessington Street	St Kilda	Port Phillip Eco Centre	112	1967
CCE159	5-7 Duke Street	St Kilda	St Kilda Youth Services(SKYS) -Formerly: Theo's Youth Centre	158	1915
CCE279	224 Danks Street	Albert Park	Mary Kehoe Centre	417	1880
CCE284	14A Ferrars Place	South Melbourne	RSL Hall	472	1924
CCE299	1-5 Howe Crescent	South Melbourne	South Melbourne Elderly Citizens Club	512.6	1948
CCE301	180-204 Montague Street	South Melbourne	Sol Green Community Centre	317	1970
CCE305	62-74 Pickles Street	South Melbourne	Conservation Volunteers (Formerly Pickles Street School)	800	1890
CCE307	254-256 Richardson Street	Albert Park	Middle Park Community Hall, Middle Park Library, Middle Park Kindergarten, & Middle Park Maternal &Child Health Centre	see comments	1970
CCE329	10 Centre Avenue	Port Melbourne	Fisherman's Bend Community Centre	371.6	1940
CCE333	219 Esplanade East	Port Melbourne	Port Melbourne Centre & Trugo Club In Edwards Park	103	1930
CCE338	81 Liardet Street	Port Melbourne	Port Phillip Community Centre / Southport (Used by a range of groups)		1940
CCE339	85 Liardet Street	Port Melbourne	COMMUNITY OFFICE		1940
CCE347	154 Liardet Street	Port Melbourne	Liardet Community Centre & Dwelling (Currently under renovation 2003 - 2004)	535	1964/2004
CCE359	1 Tucker Avenue	Port Melbourne	Garden City Reserve - Sandridge Centre & Trugo Club - Wood Shed	121	1940
CCE519	63B Ormond Esplanade	Elwood	Elwood Foreshore Community Centre	215	1994
CCE521	87 Tennyson St, Elwood	Elwood	Timber weatherboard, painted		1860
CCE521	85-87 Tennyson Street	Elwood	Elwood St Kilda Neighbourhood Learning Centre	291	1860
			Council Operational		
OPS311&OPS530	56-78 White Street	South Melbourne	South Melbourne Transfer Station- Control Office	13	1930
OPS313&OPS531	56-78 White Street	South Melbourne	South Melbourne Transfer Station- Transfer Station	425	1930
OPS314	69-81 White Street	South Melbourne	South Melbourne Depot- Workshop	2465	1930
OPS315 & OPS514	69-81 White Street	South Melbourne	South Melbourne Depot- Indoor Store	539	1930
OPS316	69-81 White Street	South Melbourne	South Melbourne Depot- Open Shed	346	1930

Building Asset ID	ADDRESS	SUBURB	DESCRIPTION	APPROX AREA	AGE
OPS317	69-81 White Street	South Melbourne	South Melbourne Depot - Canopy	631	1930
OPS318	69-81 White Street	South Melbourne	South Melbourne Depot- Office	649	1980
OPS321	333 Bay Street	Port Melbourne	Port Melbourne Library, Townhall, Clock Tower, MCHC, & WC	2021	1880/2003
OPS390-394 & CML 384-393 &	523 Williamstown Road	Port Melbourne	Works Depot & Skinks - Indigenous Nursery	1200	1940
OPS500	99A Carlisle Street	St Kilda	St Kilda Town Hall- (Town Hall)	756	1880
OPS500	99A Carlisle Street	St Kilda	St Kilda Town Hall- Existing Building	3904	1880
OPS500	99A Carlisle Street	St Kilda	St Kilda Town Hall- Storage Basement	1190	1880
OPS501	200-202 Bank Street	South Melbourne	Shop - Ground Floor	497	1875
OPS501	200-202 Bank Street	South Melbourne	Office - 1st Floor	497	1875
OPS502	208-220 Bank Street	South Melbourne	South Melbourne Town Hall- Office	3054	1875
OPS502	208-220 Bank Street	South Melbourne	South Melbourne Town Hall-Main Hall	771	1875
OPS502	208-220 Bank Street	South Melbourne	South Melbourne Town Hall- Gallery	98	1875
OPS502	208-220 Bank Street	South Melbourne	South Melbourne Town Hall- Supper Room	303	1875
OPS502	208-220 Bank Street	South Melbourne	South Melbourne Town Hall-- Engineers	268	1875
OPS502	208-220 Bank Street	South Melbourne	South Melbourne Town Hall- Other	524	1875
OPS506	147 Liardet Street	Port Melbourne	Old Port Melbourne Library	930	1940
Libraries					
LIB148	150 Carlisle Street	St Kilda	St Kilda Library	2314	1973
LIB238	195-207 Bank Street	South Melbourne	Emerald Hill Library / Save Albert Park (Office)	418	1857
Markets					
MKT505	1/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	116-136 Cecil Street	South Melbourne	South Melbourne Market- Part A	8026	1960
MKT505	116-136 Cecil Street	South Melbourne	South Melbourne Market- Part B	1495	1960
MKT505	116-136 Cecil Street	South Melbourne	South Melbourne Market- Part C	1500	1960
MKT505	2/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	3/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	4-5/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	10/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	11/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960

Building Asset ID	ADDRESS	SUBURB	DESCRIPTION	APPROX AREA	AGE
MKT505	13/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	6/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	7/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	8/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	9/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	14/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	15/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	16/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
MKT505	17/322-326 Coventry Street	South Melbourne	Shop - food court and tenancy		1960
Parks & Gardens					
P&G081	329A Beaconsfield Parade	St Kilda	Catani Gardens -Rotunda	51	1988
P&G096	55A Blessington Street	St Kilda	St Kilda Botanical Gardens- Change rooms	60	1970
P&G099	55A Blessington Street	St Kilda	St Kilda Botanical Gardens- Toolshed	46	1980
P&G103	55A Blessington Street	St Kilda	St Kilda Botanical Gardens- Conservatory	353	1989
P&G176	351 Inkerman Street	Balaclava	Hewison Rresrve & Store - key avail	14	1950
P&G189	1 Lower Esplanade	St Kilda	Catani Clock Tower/ Upper Esplanade Clocktower	200	1900
P&G288	3/1A St Vincent Place (340-348 Ferrars Street)	South Melbourne	St Vincent Gardens- Part 4 (Shelter Shed Bldg F)	18.15	1970
P&G326	70 Beach Street	Port Melbourne	Rotunda /Bandstand	70	1950
P&G353	105 Raglan Street	Port Melbourne	Sangster Reserve: Brick Store (Rates & Utility)	45	1940
Public Toilets					
PTS084	Cummings Reserve (south end), Beaconsfield Pde at Cowderoy St intersection	St Kilda	Concrete bricks		1960
PTS154	150-200 Dandenong Road	Balaclava	Alma Park - WC Block	20	1970
PTS156	Cnr Chapel St & Dandenong Rd (southeast cnr.)	St Kilda	Besser brick, rough		1970
PTS190	1 Lower Esplanade-on slope to Upper Esplanade	St Kilda	WC-Rendered concrete, painted	279	1930
PTS192	42-54A Marine Pde	St Kilda	St Kilda Marina - WC	70	1969
PTS327	70 Beach Street	Port Melbourne	Women WC (Red brick)	60	1950
PTS334	219 Esplanade East	Port Melbourne	Toilet Block in Edwards Park	50	1930
PTS402	70 Beach Street	Port Melbourne	Men WC (Red brick)	60	1950
PTS411	Eastern Rd, South Melbourne	South Melbourne	Bagged brickwork, painted (replaced by portable toilet)		1950
PTS414	Bowen Crescent, South Melbourne	South Melbourne	Bluestone		1980

Building Asset ID	ADDRESS	SUBURB	DESCRIPTION	APPROX AREA	AGE
PTS421	9A Ormond Esplanade	Elwood	Point Ormond Reserve-WC Block Opp Bluff Ave	32	1950
PTS425	200 Alma Rd	St Kilda	concrete painted - at the same location as child centre under Community centre		1930
			Sports & Recreation		
S&R 169-173	Rear 63-71 Grey Street	St Kilda	Grey Street Reserve- Pavillion	56	1984
S&R 169-174	Rear 63-71 Grey Street	St Kilda	Grey Street Reserve- Plant Nursery	50	1989
S&R085	332A Beaconsfield Parade	St Kilda	Kiosk	28	1960
S&R153	150-200 Dandenong Road	Balaclava	Alma Park -Change rooms & WC	70	1950
S&R162	3 Elwood Foreshore	Elwood	Elwood Angling Clubhouse	902	1950
S&R184	34 Jacka Boulevard	St Kilda	St Kilda Life Saving Club & William Crawford Pavillion	370	1976
S&R212	69A Ormond Esplanade	Elwood	Elwood Tennis Club Pavillion	62	1983
S&R216-217	135A Ormond Esplanade	Elwood	Elwood Croquet Club Pavillion (Bowling Club)	65	1970
S&R216-217	135A Ormond Esplanade	Elwood	Elwood Croquet Club - 6 Timber Shelter	12	1970
S&R253	129B Beaconsfield Parade, Opp Kerferd Road	Albert Park	Albert Park Yachting & Angling Club	450	1930
S&R286	3/1A St Vincent Place (340-348 Ferrars Street)	South Melbourne	St Vincent Gardens- Part 2 (Storage- Bldgs B,D,K)	41.93	1970
S&R286 PTS516	3/1A St Vincent Place (340-348 Ferrars Street)	South Melbourne	St Vincent Gardens- Part 3 (M&F WC'S BldgsE,H,J)	62.07	1970
S&R303	211A Dorcas Street	South Melbourne	Skinners Adventure Playground (Vacant Site Housing Adventure Playground & Playground Office) open 3.30-5.30	105	1940
S&R349	351-351A Williamstown Road	Port Melbourne	JL Murphy Reserve Pavillions/ WC'S	612	1940/2003
S&R356	130 Spring Street West	Port Melbourne	Port Melbourne Bowling Club	328	1940
S&R357	240 The Boulevard	Port Melbourne	Sandridge Life Saving Club	250	1970
S&R358	240 The Boulevard	Port Melbourne	Dressing Sheds	128	1970
S&R363	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:8 Mens Toilets	34	1940
S&R363	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg: 9 Women's Toilets	34	1940
S&R363	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:7 Grandstand - Refurbished	268	1940
S&R363	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:15 Mens Convenience	22	1940
S&R363	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg: 13 Women's Convenience	11	1940
S&R365	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg: Ticket Box	7	1940
S&R365	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:4 Turntiles	3	1940
S&R365	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:12 Kiosk	23	1940
S&R365	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:19 Turnstiles (Williamstown Road)	10	1940

Building Asset ID	ADDRESS	SUBURB	DESCRIPTION	APPROX AREA	AGE
S&R365	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:17 Ticket Box	2	1940
S&R368	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:5 Dressing Rooms & Toilets	420	1940
S&R368	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:6 Storeroom, Press box	143	1940
S&R369	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:1Grandstand (CAP 1264)	1264	1940
S&R370	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:30 Office Amenities Block	220	1940
S&R371 & S&R 372	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:24 Office & Equipment Store	14	1940
S&R373	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:14 Equipment Store	16	1940
S&R373	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:26 Garage	100	1940
S&R373	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:28 Equipment Shed	135	1940
S&R375	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg: Toilets	23	1940
S&R378	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:16 Kiosk	13	1940
S&R380	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg::18 Turnstiles (Ingles Street)	10	1940
S&R381	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:10 Turnstiles (Inner)	18.5	1940
S&R382	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:20 Men/Women WC (Ingles Street)	91	1940
S&R383	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:21 Scoreboard (Ingles Street)	33	1940
S&R504	72A Beaconsfield Parade, Opp Withers Street	Albert Park	South Melbourne Life Saving Club & Kiosk - William Crawford Pavillion	555	1950
S&R504	Beaconsfield Pde at Withers St (Sth Melb. Life Saving Club)	South Melbourne	Red brick		1950
S&R507	351-351A Williamstown Road	Port Melbourne	JL Murphy Reserve- Port Melb Soccer Club Pavillion	800	1940
S&R508	83-85 Swallow Street	Port Melbourne	Morris Reserve - WC	50	1940
S&R508	83-85 Swallow Street	Port Melbourne	Morris Reserve - Port Melbourne Tennis Club Pavillion	132.6	1940
S&R509	Elwood Lifesaving Club	Elwood	Grey besser brick		1971
S&R509	11 Elwood Foreshore	Elwood	Elwood Life Saving Club	270	1971 / 2004
S&R509	9 Elwood Foreshore	Elwood	John R Conebere Pavillion	456	1971 / 2004
S&R509	15 Elwood Foreshore	Elwood	Sails On The Bay Restaurant	302	1971/1994/2004
S&R515	St Vincent Gardens (South)	South Melbourne	Brick, painted - part of tennis club		1950
S&R520	Elwood Park, 105A Ormond Esplanade	Elwood	Grey bessar brick		1979
S&R520	105A Ormond Esplanade	Elwood	Elwood Park & Pavillion	527	1979
S&R522	Dunstan Pde - Port Melbourne	Port Melbourne	Julier Reserve -Brick		1940
S&R522	140 Dunstan Parade	Port Melbourne	RF Julier Reserve - Gymnasium	157.5	1940

Building Asset ID	ADDRESS	SUBURB	DESCRIPTION	APPROX AREA	AGE
S&R523	180 Esplanade West	Port Melbourne	Lagoon Reserve -Brick Toilet		1930
S&R523	180 Esplanade West	Port Melbourne	Lagoon Reserve- Sports Pavillion	103	1930
S&R524	Blessington Street	St Kilda	Peanut Farm Reserve - Brick		1981
S&R524	12A Blessington Street	St Kilda	Peanut Far, Pavillion, Reserve & Renfrey Gardens	490	1981
S&R527	38 Beach Street	Port Melbourne	Port Melbourne Yacht Club	160	1950/1990
Not located	525 Williamstown Road	Port Melbourne	Port Melb Cricket/Football Club-Bldg:11 Changebox (Inner)	3	1940

Asbestos Register
City of Port Phillip

Building Description: South Melbourne Market
Site Address: Cecil Street, South Melbourne **Inspection Date:** 8/09/2010

Location	Asbestos Material	Sample Number	Comment
Stalls			
Floor covering			Concrete, ceramic tiles
Floor covering - Stall 210			Non-asbestos vinyl tiles
Walls			Masonite, metal, particle board, plaster
		See 200505.12	Cement sheet. No asbestos detected. Taken from Stall 190. Previous report.[1]
		See 200505.13	Cement sheet. No asbestos detected. Taken from hut adjacent to Stall 173. Previous report.[1]
Ceiling			Masonite, particle board, metal, fibreglass, plaster
Stalls 115/116			
Floor covering			Non-asbestos black & white vinyl tiles
General			
Floor			Concrete
Walls			Metal, brick, concrete
Ceiling / Roof			Metal, concrete
Roof Top Car Park			
Stairs entry awning			Non-asbestos cement sheet
Loading Bay Driveway			
Walls to rear of shops			Non-asbestos cement sheet
Tenancies - Deli Section			
Walls			Ceramic tiles
Walls under ceramic tiles	Cement sheet		Asbestos cement sheet may be present
Market Office adjacent Stall 116			
External wall	Imitation timber cement sheet planks		Possible asbestos
Office internal			No asbestos containing materials located
Food Hall			No asbestos containing materials located. Opened 1992.
Deli Aisles			No asbestos materials located. Refurbished 2005.
Restaurants along Cecil Street			No asbestos materials located. Refurbished 2005.

1. Part 5 Asbestos Materials Report - Howell Facilities: City of Port Phillip. Prepared by JTA Risk Management between March and May 2005.

CLIENTS | PEOPLE | PERFORMANCE

Paul Morgan Architects

Specification for South Melbourne Market

Electrical Services

Tender Issue

May 2011

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. General requirements

1.1 General

This specification is written to cover all associated electrical works for the development of roof over the car park area at South Melbourne Market, South Melbourne Victoria. It comprises of the supply & installation of electrical and photovoltaic services.

The works covered by this section of the specification includes the supply of all labour and materials for the supply, fabrication, manufacture, setting out, installation, testing and commissioning, 12 months maintenance and warranty of all materials, equipment and workmanship necessary during the defects liability period for the electrical services as described in the drawings and specification.

The contractor shall complete the works making full allowance for all minor and incidental items necessary for the proper functioning of the whole system, even though not specifically detailed or mentioned in the contract documentation.

1.2 Responsibilities

The works for the project under this Specification include, but are not limited to;

1.2.1 Existing Buildings and Services

All works carried out are to be coordinated with the services for the existing market. Supply is to be maintained to these buildings at all times unless approved by South Melbourne Market Authority and disruption to supplies requires prior consent from South Melbourne Market for non-operable hours that do not impact on day to day market operation.

1.2.2 Main Switchboard & Distribution boards

- Provision of sub-mains cabling from existing main switchboard in underground existing HD uPVC electrical conduit using existing electrical pit and existing cable tray where possible.
- Provision of using new external pillar IP66 36-pole distribution board at car park level, new internal solar IP66 96-pole distribution board including all required switchgear, cabling and associated equipment.
- Provision of new submain cables to new distribution boards DB-Roof on car park level and DB-Solar on ground level. Cables to reticulate in existing underground conduits and cable trays where possible. Arrange on trays to cables de-rating.
- Provision of new distribution boards DB-Roof and DB-Solar including all related switchgear and control gear.
- DB's to be equipped as shown on the single line diagrams including spare RCBOs and pole fillers.
- RCD's are to be installed on all lighting, general power and other circuits in accordance with AS/NZS3000:2007.
- DB 's and inverter rack to be provided with pad-lockable isolators as per AS4777 to isolate the PV installation during routine maintenance.

- Provision of new MCCB for boards.
- Bi-directional meter in accordance with Citipower requirements.
- DB's are to be built to accommodate the required amount of switchgear for lighting control and other systems. All control mechanisms to be concluded behind escutcheon plate.
- DB-Roof to be located close to the column adjacent to the back of the lift shaft facing west. DB to be IP66, heavy duty padlockable door swing handle, pillar height at 1.6 meter bolted to the concrete slab with all the incoming cable through the bottom gland. Provision for crash bollard surrounding the DB.
- All sub-mains or photovoltaic cables exposed to the elements shall be protected by cable tray covers or suitably sized flexible conduits to prevent degradation or sheath properties due to UV radiation.
- Provision of electronically type DB-schedules to be mounted inside door compartment.

1.2.3 Lighting System

- Supply and installation of luminaires as shown on drawings including all required rod suspension systems and mechanical components required to suit the intent of the design.
- The lighting systems required shall comply with the following:
    - AS/NZS 1680
    - Building Code of Australia 2010 Section J
- Provision of car park entry ramp and general car park lighting systems including all associated cabling and cable support systems to control input/output devices.
- Override switch is to be labelled to indicate clearly the correct functionality of the switch.
- Provision of lighting control systems for car park entry ramp and general car park area.
- All fluorescent lamps (4000K) shall be controlled with high frequency dali dimmable electronic control gear or as otherwise stated.

1.2.4 Lighting Control System

Car park entry ramp and general car park area shall be automatically controlled by a Dynalite lighting control system with all components networked on a building wide Dynet network. All associated controller relay modules, clocks and Dynet power supply will be din-railed mounted in the DB-Roof in a dedicated IP66 enclosure.

Car Park Entry Ramp

Ramp lighting shall be switched and dimmed from photoelectric cell and time clock mounted onto the column at 2.7 meter height. Illuminance level has to be maintained at 800 lux at the initial 15 metre entry during daytime. Subsequent 4 metre, the illuminance level has to be maintained at 160 lux during daytime. At night, the illuminance level has to be maintained at 160 lux. Switching of these fittings shall be achieved using Dali controller modules installed in DB-Roof. Manual/Off/Auto switch will be connected to the lighting control system to enable for maintenance or security use. Dimming is to be confirmed with the principal during commissioning and the lighting levels calibrated to their satisfaction.

General Car Park

Car park lighting shall be switched and dimmed from multi-layer PIR/photoelectric cells mounted onto the column at 3 metre height. Illuminance level has to be maintained at 40 lux across all car park spaces including disable parking during day and night time. Switching of these fittings shall be achieved using Dali controller modules installed in DB-Roof. Manual/Off/Auto switch will be connected to the lighting control system to enable for maintenance or security use. Dimming is to be confirmed with the principal during commissioning and the lighting levels calibrated to their satisfaction.

1.2.5 Emergency and EXIT Lighting System

- The Electrical Contractor is to provide a stand alone emergency and exit lighting system, complete with maintenance and AS2293 test switch within the distribution board in roof distribution board with appropriate labelling.
- Test and certify system and provide log book in accordance with AS2293 Part 1&2.

1.2.6 Cable Ladders, Trays and Conduits

Supply and install all communications, power and cable trays dedicated for the photovoltaic installation, cable supports to suit distribution system as shown on plans and diagrams and include the following:

- Cable tray within column riser and roof space as shown on drawings.
- Conduits to enclose external wiring, surface run wiring, underground wiring and embedded final sub-circuit wiring.
- Install conduits as shown on the plans complete with suitable draw wires left within to facilitate pulling of future cables.
- Cable trays in existing market areas to be coordinated with existing structure and furnishings.
- Under no circumstances shall conduits be surface mounted without prior confirmation from electrical engineer. Segregation of trays as per AS/NZS 3000 and AS/ACIF S009.

1.2.7 Photovoltaic (PV)

Provision of all materials, labour, transport, tools, plant, applications, payment of fees and everything else necessary for the design, supply, installation, commission and maintenance of one hundred and fifty (150) photovoltaic (PV) grid-connected rooftop systems. This work includes:

- Complete design of the grid-connected PV systems on the roofs of the buildings as documented in this Contract;
- PV systems supply including mounting frames and labelling system, installation and commissioning;
- Application and design documentation required to satisfy Citipower requirements for connection of the PV systems to its network including provision of suitable authority approved bi-directional meter to monitor generation from PV installation and deduction from utility supply demand.
- All necessary mechanical and electrical installations associated with the installation of the PV systems including permanent and temporary safety and access equipment access to all working areas affected by the works.

1.2.8 Associated Works

- All excavation, trenching, backfilling, chasing and cable support systems associated with carrying out the electrical works are to be provided by the contractor.

1.2.9 Standards

General

Electrical systems: To AS/NZS 3000, AS/NZS 3008.1.1 and AS/NZS 4777.

Degrees of protection (IP code): To AS/NZS 60529.

1.2.10 Referenced documents

Contractual relationships

General: Responsibilities and duties of the principal, contractor and contract administrator are not altered by requirements in the documents referenced in this specification.

Current editions

General: Use referenced documents which are the editions, with amendments, current 1 month before the closing date for tenders, except where other editions or amendments are required by statutory authorities.

Site copies: Keep a copy of the following Standards on site: AS/NZS 2293.1, AS/NZS 2293.2, AS/NZS 3000, AS 3008:1.1, AS/NZS 4777 and AS 3100.

1.2.11 Interpretation

Abbreviations

General: For the purposes of this contract the abbreviations given below apply.

- AS: Australian Standard.
- BCA: Building Code of Australia.
- NATA: National Association of Testing Authorities.
- NZS: New Zealand Standard.
- SS: Stainless steel.

Definitions

General: For the purposes of this contract the definitions given below apply.

- Attendance: ‘Attendance’, ‘provide attendance’ and similar expressions mean ‘give assistance for examination and testing’.
- Contract or project administrator: ‘Contract administrator’ or ‘project administrator’ has the same meaning as ‘architect’ or ‘superintendent’ and is the person appointed by the ‘owner’ or ‘principal’ under the contract.

- Design life: The period of time for which it as assumed, in the design, that an asset will be able to perform its intended purpose with only anticipated maintenance but no major repair or replacement being necessary.
- Documented: ‘Documented’, ‘as documented’ and similar terms mean contained in the contract documents.
- Economic life: The period of time from the acquisition of an asset to when the asset, while still physically capable of fulfilling its function and with only anticipated maintenance, ceases to be the lowest cost alternative for satisfying that function.
- Geotechnical site investigation: The process of evaluating the geotechnical characteristics of the site in the context of existing or proposed construction.
- Give notice: ‘Give notice’, ‘submit’, ‘advise’, ‘inform’ and similar expressions mean ‘give notice (submit, advise, inform) in writing to the contract administrator’.
- High level interface (HLI): Systems transfer information in a digital format using an open system interface.
- Hold point: The activity cannot proceed without the approval of the contract administrator.
- If required: A conditional specification term for work which may be shown in the documents or be a legislative requirement.
- Industrial: IP56 to AS/NZS 60529.
- Inspect or inspection (by contract administrator): ‘Inspect’ or ‘inspection’ (in reference to the contract administrator) means a review for general conformance with design intent and does not in any way relieve other parties for compliance with their obligations, the specifications and drawings.
- IP: ‘IP’, ‘IP code’, ‘IP rating’ and similar expression have the same meaning as ‘IP Code’ in AS 60529.
- Low level interface (LLI): Systems transfer information via terminals and voltage free contacts.
- Maintenance period: Synonymous with ‘Defects liability period’.
- Obtain: ‘Obtain’, ‘seek’ and similar expressions mean ‘obtain (seek) in writing from the contract administrator’.
- Professional engineer: A person who is listed on the National Professional Engineers Register (NPER) in the relevant discipline at the relevant time.
- Metallic-coated steel: Includes zinc-coated steel, zinc/iron alloy-coated steel, and aluminium/zinc-coated steel.
- Pipe: Includes pipe and tube.
- Principal: ‘Principal’ has the same meaning as ‘owner’, ‘client’ and ‘proprietor’ and is the party to whom the Contractor is legally bound to construct the works.
- Proprietary: ‘Proprietary’ mean identifiable by naming manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
- Provide: ‘Provide’ and similar expressions mean ‘supply and install’. Installation shall include development of the design beyond that documented.
- Registered testing authority:

- An organisation registered by the National Association of Testing Authorities (NATA) to test in the relevant field; or
- An organisation outside Australia registered by an authority recognised by NATA through a mutual recognition agreement; or
- An organisation recognised as being a Registered Testing Authority under legislation at the time the test was undertaken.

- Required: Means required by the documents, the local council or statutory authorities.
- Samples: Includes samples, prototypes and sample panels.
- Supply: 'Supply', 'furnish' and similar expressions mean 'supply only'.
- Tests:
  - Pre-completion tests: Tests carried out before completion tests.
  - Type tests: Tests carried out on an item identical with a production item, before delivery to the site.
  - Production tests: Tests carried out on a purchased item, before delivery to the site.
  - Site tests: Tests carried out on site.
  - Completion tests: Tests carried out on completed installations or systems before the date for practical completion, to demonstrate that the installation or system, including components, controls and equipment, operates correctly, safely and efficiently, and meets performance and other requirements. The superintendent may direct that completion tests be carried out after the date for practical completion.
- Tolerance: The permitted difference between the upper limit and the lower limit of dimension, value or quantity.
- Verification: Provision of evidence or proof that a performance requirement has been met or a default exists.
- Weatherproof: IPX6 to AS/NZS 60529.
- Witness points: Provides an opportunity to attend an activity but does not involve an obligation. The activity can proceed without approval from the contract administrator.

1.2.12 Contract documents

Services diagrammatic layouts

General: Layouts of service lines, plant and equipment shown on the drawings are diagrammatic only, except where figured dimensions are provided or calculable.

Before commencing work:

- Obtain measurements and other necessary information.
- Coordinate the design and installation in conjunction with all trades.

Levels

General: Spot levels take precedence over contour lines and ground profile lines.

1.2.13 Drawings and manuals for existing services

General

General: No warranty is given as to the completeness or accuracy of drawings and/or manuals of existing services.

1.2.14 Notice

Inspection

Concealment: If notice of inspection is required in respect of parts of the works that are to be concealed, advise when the inspection can be made before concealment.

Minimum notice for inspections to be made: 5 working days.

Submissions

Program: Allow in the construction program for at least the following times for response to submissions and each required re-submission:

- Shop drawings: 10 working days.
- Samples and prototypes: 10 working days.
- Manufacturers' or suppliers' recommendations: 5 working days.
- Product data: 10 working days.
- Product / design substitution or modification: 10 working days.

Proposed products schedules: If major products are not specified as proprietary items, submit a schedule of those proposed for use within 3 weeks of site possession.

Tests

General: Give notice of the time and place of nominated tests.

Minimum notice for witnessing of tests to be made: 5 working days.

1.2.15 Inspection

Attendance

General: Provide attendance for inspection and tests.

1.2.16 Submissions

Approval for submissions: Contract administrator.

Authorities

Authorities' approvals: Submit documents showing approval by the authorities whose requirements apply to the work.

Correspondence: Submit copies of correspondence and notes of meetings with authorities whose requirements apply to the work.

Electronic submissions

File format: Drawings: Both AutoCAD 2004.dwg or later version using an agreed layering and drawing convention and Adobe PDF Version 7 or later version. Text documents: Indexed PDF Version 7 or later.

Hard copy submissions

Quantity:

- Bound documents: 4 sets as paper prints.
- Loose documents larger than A3: 4 copies.
- Loose documents up to and including A3: One copy.

Standard contract drawing size: A3

Errors

General: If a submission contains errors, make a new or amended submission as appropriate, indicating changes made since the previous submission.

Identification

General: Identify the project, contractor, subcontractor or supplier, manufacturer, applicable product, model number and options, as appropriate and include pertinent contract document references. Include service connection requirements and product certification. Identify proposals for non-compliance with project requirements, and characteristics which may be detrimental to successful performance of the completed work.

Inspection and testing plan

General: Submit an inspection and testing plan which is consistent with the construction program. Include particulars of test stages and procedures.

Test reports: Submit written reports on nominated tests.

Materials and components

Product certification: If products must conform to product certification schemes, submit evidence of conformance.

Product data: For proprietary equipment, submit the manufacturer's product data as follows:

- Technical specifications and drawings.
- Type-test reports.
- Performance and rating tables.
- Recommendations for installation and maintenance.
- Additional product data for services equipment:
    - Model name, designation and number.
    - Country of origin and manufacture.
    - Capacity of all system elements.
    - Size, including required clearances for installation.

- Materials used in the construction.

Proposed product schedules: If major products are not specified as proprietary items, submit a schedule of those proposed for use within 2 weeks of site possession.

Substitution

Performance: Equal or greater to that specified.

Alternatives: If alternatives to the documented products, methods or systems are proposed, submit sufficient information to permit evaluation of the proposed alternatives including the following:

- Samples.
- Essential technical information, in English.
- Reasons for the proposed substitutions.
- Statement of the extent of revisions to the contract documents.
- Statement of the extent of revisions to the construction program.
- Statement of cost implications including costs outside the contract.
- Statement of consequent alterations to other parts of the works.

Some substitutions will require recalculation of the design to confirm BCA compliance. Allow to perform the recalculation and submit to the Building Surveyor for approval.

Costs: Pay the cost of submissions and of evaluations and tests of proposed alternatives, whether subsequently accepted as a variation or not. The costs shall be calculated at the current charge-out rates of the relevant consultant(s).

Evidence: If the documented products or systems is unavailable within the time constraints of the construction programme submit evidence, from the supplier.

Criteria: If the substitution covers unavailability or is for any other reason, submit evidence that the substitution:

- Is of net enhanced value to the Proprietor.
- Is consistent with the contract documents and is as effectual as the identified proprietary item.

Samples

Submission: Submit nominated samples.

Incorporation of samples: If it is intended to incorporate samples into the works, submit proposals. Incorporate samples in the works which have been endorsed for incorporation. Do not incorporate other samples.

Retention of samples: Keep endorsed samples in good condition on site, until practical completion.

Shop drawings

General: If required, submit dimensioned drawings showing details of the fabrication and installation of services and equipment, including relationship to building structure and other services, cable type and size, and marking details.

Diagrammatic layouts: Coordinate work shown diagrammatically in the contract documents, and submit dimensioned set-out drawings.

Submission medium: Electronic and hard copy.

Timing: Submit shop drawings for examination prior to ordering or production, including prototypes. In general, do not manufacture, assemble or supply any item or component which is the subject of shop drawings until the applicable stamped drawings are returned.

Rejection: If a document is rejected, submit a new or amended document as directed.

Shop drawing schedule: Before starting shop drawings, submit a detailed schedule and program for submission of all shop drawings required to be provided during the course of the works. The schedule shall be co-ordinated with the general construction program and shall be amended as necessary to accommodate any changes to the general program and be re-submitted. Allow sufficient time for any or all re-examinations and resubmissions in the event of incorrect or inadequate drawings.

Information: Provide at least the following:

- (Initially) proposed submission dates of each shop drawing;
- (During the course of the works) the actual submission dates;
- Dates of submission of drawings for examination.
- Examined drawings.
- Drawings to be amended.
- Dates of resubmission of amended drawings.

Updates: Update and resubmit the schedule with every submission and re-submission of shop drawings, using the amendment number A, B, C, etc. to identify revisions.

Timing and delays: Ensure that all shop drawings are submitted at such times as to permit examination (or amendment, resubmission and re-examination) and the subsequent ordering, fabrication or manufacture to commence in accordance with the construction program. Delays caused by late submission of shop drawings or submission of inadequate or incomplete shop drawings will not be accepted as justification for variations to the contract or extensions of time.

Submission dates: To give effect to the preceding requirement, prepare and submit within 5 days after date of acceptance of tender, a schedule of submission dates for all shop drawings required or specified under the subcontract. The submission program shall be arranged to submit shop drawings in a regulated manner so that large numbers of drawings are not presented at the one time and to facilitate the examination process.

Dimensioning: All elements shall be drawn dimensionally related to all structural elements which they abut or to which they are connected and showing dimensional relationships to the column grids. Verify all relevant dimensions and dimension drawings so that the items or components fit accurately into the required positions.

Services: Indicate in all shop drawings where services occur, i.e. in or on walls, partitions, joinery, furniture and workstations, or where above-ceiling acoustic baffling or walls are penetrated by services, showing methods of reticulating services and positions of services entries and outlets, access panels and

all other similar situations. Co-ordinate and accurately locate services' entry and outlet points in conjunction with the structure before finalising drawings.

Formatting: All shop drawings shall have a title block, title, sequential drawing number, amendment column, date of amendments and issue, scale and north point. All details shall be fully dimensioned, annotated, including manufacturers' names and catalogue numbers where appropriate, cross referenced and titled and their locations shown on the general arrangement plans. Drawings shall be on the same size drawing sheets and of similar format to the Contract drawings.

Examination by consultants: Within the period specified after receipt of a document, the contract administrator will advise whether the document is suitable or unsuitable and will return the document, provided that any comments of any nature made by consultants will be made in good faith as an assistance to the Contractor. The consultants will not be responsible for dimensions, quantities, calculations or methods of manufacture, nor will the consultants warrant that all information is shown.

Completion: After all amendments have been carried out to the satisfaction of the contract administrator, provide the numbers of hard copy prints specified and PDF files, for the use of the contract administrator and consultants.

Permission to use: Shall imply only that the Contractor's interpretations of the relevant requirements of the Contract are generally acceptable but shall in no way relieve the Contractor of its obligations to construct and complete the works correctly and accurately and in accordance with the Contract documents.

Availability: Keep copies of all current and superseded shop drawings on site for the use of the contract administrator. Keep current shop drawings up to date and together in sets. Store superseded drawings systematically and separately from current drawings to facilitate convenient reference and to ensure that superseded drawings are not referenced in error.

Drawings

These drawings form part of the specification:

31-26867-E001 – Legend, Notes and Drawing Index

31-26867-E002 – Carpark Lighting Layout

31-26867-E003 – Ground Floor Power Layout

31-26867-E004 – Schematic Diagram - Electrical

31-26867-E005 – Carpark Power Layout

31-26867-E006 – Roof PV Panels Layout

31-26867-E007 – Schematic Diagram – Photovoltaic System

31-26867-E008 – Schematic Diagram – Dynalite System

General: Minimum A1 drawing size.

Standard: To AS 1100 Parts 101 and 301, AS 1102 Parts 101, 102, 103, 106, 107, 108, and 111 as applicable.

Building work drawings: Submit detailed dimensioned drawings showing all:

- Access doors and panels.
- Conduits to be cast in slabs.
- Holding down bolts and other anchorage and/or fixings required complete with loads to be imposed on the structure during installation and operation.
- Openings, penetrations and block-outs.
- Pipe sleeves.
- Plinths, kerbs and bases.
- Required external openings.

Services coordination: Ensure coordination with other building and service elements. Show adjusted positions on the shop and record drawings.

Space requirements: Check space requirements of equipment and services indicated diagrammatically in the contract documents and submit a report on consequent variations to the design.

Execution details

General: Before starting the respective portions of the installation, submit the following:

- Embedded services: Proposed method for embedding services in concrete walls or floors or chasing into concrete or masonry walls.
- Fixing of services: Typical details of locations, types and methods of fixing of services to structure.
- Inaccessible services: If services will be enclosed and not accessible after completion, submit proposals for location of service runs and fittings.

Marking and labelling

General: Before marking and labelling submit:

- Samples of the proposed labels.
- A schedule showing, for each item or type of item:
    - A description of the item or type of item sufficient to identify it.
    - The proposed text of the marking or label
    - The proposed location of the marking or label.

Building penetrations

General: If it is proposed to penetrate or fix to the following, submit details of the methods proposed to maintain the required structural, fire and other properties:

- Structural building elements including external walls, fire walls, fire doors and access panels, other tested and rated assemblies or elements, floor slabs and beams.
- Membrane elements including damp-proof courses, waterproofing membranes and roof coverings. If penetrating membranes, provide a waterproof seal between the membrane and the penetrating component.

Technical data

Data to be submitted: Include at least the following information in technical submissions:

- Assumptions.
- Calculations.
- Certification of compliance with the applicable code or standard.
- Design basis and performance parameters.
- Drawings.
- Installation and maintenance requirements.
- Manufacturers' technical literature.
- Risk assessment.
- Samples where relevant.
- Sketch, single line diagram, flowchart.
- Technical data schedules corresponding to the equipment schedules in the contract documents. If there is a discrepancy between the two, substantiate the change.

Certification

Submit certification that the plant and equipment submitted meets all requirements and capacities of the contract documents except for departures that are identified in the submission.

The marking-up, permission to use or endorsement of submitted drawings or equipment details does not in any way constitute an instruction nor does it relieve the Contractor of responsibility for the errors, omissions or compliance with the requirements of the Contract.

1.3 Products

1.3.1 Tests

Attendance

General: Provide attendance on tests.

Testing authorities

General: Except for site tests, have tests carried out by a Registered testing authority and submit test reports.

- Reports: Submit copies of test reports, including certificates for type tests, showing the observations and results of tests and conformance or non-conformance with requirements.
- Site tests: Use instruments calibrated by authorities accredited by a Registered testing authority.

Currency for test reports: Test reports shall conform with the current editions of referenced documents as described under *Referenced documents.* Manufacturers or suppliers shall monitor standards' changes affecting their products and initiate the appropriate actions to maintain the conformance of their products with current test reports. Notwithstanding this requirement, any change to a product or a component subject to a test report (whether supplied individually or as part of a product) must be advised for

assessment prior to its incorporation in the project. Test reports that are dated 6 or more years prior to the submission date will not be accepted.

1.3.2 Materials and components

Consistency

General: For each material or product use the same manufacturer or source and provide consistent type, size, quality and appearance.

Accessories: All accessories and outlets located in close proximity are to be of the same manufacture, size and material and, unless otherwise detailed, of the same colour.

1.3.3 Proprietary items

Manufacturers' or suppliers' recommendations

Proprietary items: Provide, including select, if no selection is given, and transport, deliver, store, handle, protect, finish, adjust, prepare for use, and provide manufactured items in accordance with the current written recommendations and instructions of the manufacturer or supplier.

Proprietary systems/assemblies: Assemble, install or fix to substrate in accordance with the current written recommendations and instructions of the manufacturer or supplier.

Project modifications: Advise of activities that supplement, or are contrary to, manufacturer's or suppliers' written recommendations and instructions.

Product certification: If products must comply with product certification schemes, provide them in accordance with the certification requirements.

Identified proprietary items

Implication: Identification of a proprietary item does not necessarily imply exclusive preference for the item so identified, but indicates the necessary properties of the item.

Sealed containers

General: If materials or products are supplied by the manufacturer in closed or sealed containers or packages, bring the materials or products to point of use in the original containers or packages.

Sources policy

General: Use products manufactured in Australian or New Zealand, and comprising materials and components manufactured in Australia and New Zealand, unless no such products satisfy project requirements.

1.4 Execution

1.4.1 Performance

General

Performance criteria: Meet the performance criteria as specified in the relevant worksections.

1.4.2 Fixing

General

Suitability: If equipment and services are not suitable for fixing to non-structural building elements, fix directly to structure and trim around penetrations in non-structural elements.

Fasteners

Use proprietary fasteners capable or transmitting the loads imposed, and sufficient to ensure the rigidity of the assembly.

1.4.3 Demolition

General

General: Decommission, isolate, demolish and remove from the site all existing redundant cables and equipment including minor associated components that become redundant as a result of the demolition. Undertake the work consistent with minimising damage to surfaces which would need to be made good.

Breaking down: Disassemble or cut up equipment where necessary to allow removal.

Salvaged materials: Salvage all components associated with the listed items. Minimise damage during removal and deliver to the locations scheduled.

Demolished materials classes

Ownership and implementation: Comply with the Demolished materials classes table.

Demolished materials classes table

Class	Requirement	Ownership
Salvaged items for re-use in the works	Recover without damage items identified in the Salvaged items for re-use in the works schedule	Principal/Proprietor
Salvaged items for delivery to the principal	Recover without damage items identified in the Salvaged items for delivery to principal schedule.	Principal/Proprietor
Demolished for removal	Remove from the site demolished materials identified in the Demolish for removal schedule. Do not burn or bury on site Transit: Prevent spillage of demolishing materials in transit	Contractor

Re-used components

General: Clean re-used components and test for compliance with current Australian Standards before returning to service. Provide results of compliance tests.

Existing to remain: Where existing wiring, conduits, fittings, equipment, apparatus and the like are encountered, obstructed or damaged in the course of the work, and they are to remain, repair, divert, relocate as required to achieve a concealed installation generally. Where diversion of wiring requires the use of junction boxes, conceal such junction boxes but ensure that they are readily accessible. The

installation works shall be to the satisfaction of the responsible electrical inspector in the case of HV and LV power wiring and associated fittings, and to approval in other cases, all without cost variation to the contract.

1.4.4 Services connections

Connections

General: Connect to statutory authorities' services or service points. Excavate to locate and expose connection points. On completion reinstate the surfaces and facilities that have been disturbed.

Statutory authorities' requirements

General: If the authorities elect to perform or supply part of the works, make the necessary arrangements. Install equipment supplied, but not installed, by the authorities.

1.4.5 Installation

General

Fixing: If non-structural building elements are not suitable for fixing equipment and services to, fix directly to structure and trim around holes or penetrations in non-structural elements.

Installation: Install equipment and services plumb, fix securely and organise reticulated services neatly. Allow for movement in both structure and services.

Concealment: Conceal all cables, ducts, trays, pipes etc unless installed in plant spaces, ceilings, riser cupboards, etc or unless otherwise detailed.

Lifting: Provide heavy items of equipment with permanent fixtures for lifting as recommended by the manufacturer.

Suspended ground floors: Keep all parts of services under suspended ground floors > 150 mm clear of the ground surface. Make sure services do not impede access.

Arrangement: Arrange services so that services running together are parallel with each other and with adjacent building elements.

Cable systems

Systems: Provide the following:

- Accessible concealed spaces: Thermoplastic insulated and sheathed cables.
- Inaccessible concealed spaces: Cable in UPVC conduit.
- Plant rooms: Cable in heavy duty UPVC conduit, or on tray or in duct.
- Plastered or rendered surfaces: Cable in UPVC conduit.
- Stud walls without bulk insulation: Thermoplastic insulated and sheathed cables.
- Walls filled with bulk thermal insulation: Cables in PVC conduit.

Installation of accessories

General: Install accessories in conformance with the Installation of accessories table.

Location: Final location of all outlets and equipment to be confirmed on site prior to installation.

Default mounting heights to centre of accessory plate subject to the architect's on-site direction or details:

Outlets	300 mm
Switches and controls	1100 mm

Flush mounting: Provide flush mounted accessories except in plant rooms.

Common face plates: Mount adjacent flush mounted accessories under a common faceplate.

Restricted location: Do not install wall boxes across junctions of wall finishes.

Surface mounting: Proprietary mounting blocks.

Installation of accessories table

Wall construction	**Installation and concealed cabling facilities**
Rendered masonry partition	Flush wall box with conduit chased into wall
Double sided face brick partition	Vertically mounted flush wall box with conduit concealed in cut bricks
Face brick external cavity wall	Flush wall box with thermoplastic insulated cables in conduit run in cavity and tied against inner brick surface, or thermoplastic sheathed cables run in cavity
Stud partition	Rewirable

Installation of ceiling mounted appliances

Connections: Appliances: Provide flush mounted outlets on the ceiling next to support brackets.

Connections: Fixed equipment: Provide concealed permanent connections.

Fixing: For equipment and appliances heavier than 30 kg provide support through the suspended ceiling to the building structure. Brace appliances that have excessive bending moments, are heavy or vibrate, to prevent horizontal movement. If non-conventional ceilings are used their ability to support appliances and equipment must be confirmed with the supplier.

Differential movement

General: If the geotechnical site investigation report predicts differential movements between buildings and the ground in which conduits are buried, provide movement control joints in the conduits.

- Location: Adjacent to the conduit supports which are closest to the perimeter of the building.
- Arrangement: Arrange conduits to minimise the number of movement control joints.
- Magnitude: Accommodate the predicted movements.

Holes and chases

General: If holes and chases are required in masonry walls, provide proposals to demonstrate that the structural integrity of the wall is maintained. Do not chase walls nominated as fire rated or acoustic. Parallel chases or recesses on opposite faces of a wall shall not be closer than 600 mm to each other.

Chasing of blockwork: Only in core-filled hollow blocks or in solid blocks which are not designated as structural or where there are restrictions on chasing, etc. intended to limit sound transmission (e.g. BCA) and shall be to the Concrete blockwork chasing table.

Concrete blockwork chasing table

Block thickness (mm)	Depth of chase (maximum mm)
190	35
140	25
90	20

Penetrations

Fire rated building elements: Seal penetrations with a system conforming to AS 4072.1.

Non-fire rated building elements: Seal penetrations around conduits and sleeves. Seal around cables within sleeves. If the building element is acoustically rated, maintain the rating.

Sleeves

General: If piping or conduit penetrates building elements, provide metal or UPVC sleeves formed from pipe sections as follows:

- Movement: Arrange to permit normal pipe or conduit movement.
- Diameter (for non fire-rated building elements): Sufficient to provide an annular space around the pipe or pipe insulation of at least 12 mm.
- Prime paint ferrous surfaces.
- Terminations:
    - If cover plates are fitted: Flush with the finished building surface.
    - In fire-rated and acoustic-rated building elements: 50 mm beyond finished building surface.
    - In floors draining to floor wastes: 50 mm above finished floor.
    - Elsewhere: 5 mm beyond finished building surface.
- Termite management: To AS 3660.1.
- Thickness:
    - Metal: ≥ 1 mm.
    - UPVC: ≥ 3 mm.

Sleeves for cables

General: For penetrations of cables not enclosed in conduit through ground floor slabs, beams and external walls provide sleeves formed from UPVC pipe sections.

- MIMS cables: Provide sleeves for penetrations through masonry.

1.4.6 Concrete plinths

Construction

General: Provide plinths under all equipment located on concrete floor slabs as follows:

- Concrete: Grade N20.
- Finish: Steel float flush with the surround.
- Reinforcement: Single layer of F62 fabric.
- Surround: Provide galvanized steel surround at least 75 mm high and 1.6 mm thick. Fix to the floor with masonry anchors. Fill with concrete.

1.4.7 Plant and equipment access

General

Services and equipment: Locate and arrange all services and equipment so that:

- Failure of plant and equipment (including leaks) does not create a hazard for the building occupants.
- Failure of plant and equipment (including leaks) cause a minimum or no damage to the building, its finishes and contents.
- Inspection and maintenance operations can be arranged to minimise inconvenience and disruption to building occupants or damage to the building structure or finishes.
- Services and equipment are readily accessible for inspection and maintenance and arranged so that inspection and maintenance can be carried out in a safe and efficient manner. Include the following:
- Conform to the relevant requirements of AS 1470, AS 1657, AS/NZS 1892.1 and AS/NZS 2865.
- If parts of the plant require regular inspection and maintenance either locate plant so it is safely accessible from floor level or provide permanent access platforms and ladders.
- In false ceilings locate items of equipment that require inspection and maintenance above tiled parts where possible. If this is not possible (for example if above set plaster or other inaccessible ceilings) provide access panels. Arrange services and plant locations to reduce the number of access panels. Coordinate with other trades to use common access panels where feasible.
- Modify manufacturer's standard equipment when necessary to provide the plant access in the contract documents.

1.4.8 Painting and finishes

General

General: If exposed to view (including in plant rooms) paint new services and equipment.

Surfaces painted or finished off-site: Conform to *Metals and prefinishes.*

Exceptions: Do not paint chromium or nickel plating, anodised aluminium, GRP, stainless steel, non-metallic flexible materials and normally lubricated machined surfaces. Surfaces with finishes applied off-site need not be re-painted on-site provided the corrosion resistance of the finish is not less than that of the respective finish in the On-site paint systems table.

Standard

General: Conform to the recommendations of AS/NZS 2311 Sections 3, 6 and 7 or AS/NZS 2312 Sections 5, 8 and 10, as applicable.

Specifications: Conform to the On-site paint systems table.

Oil and petrol resistant finishes

General: If the finished surface may be subject to oil and/or petrol provide APAS-0024/1 for the 2nd and 3rd coats in the On-site paint systems table.

Paint application

Coats: Apply the first coat immediately after substrate preparation and before contamination of the substrate can occur. Ensure each coat of paint or clear finish is uniform in colour, gloss, thickness and texture and free of runs, sags, blisters or other discontinuities.

Combinations: Do not combine paints from different manufacturers in a paint system.

Protection: Remove fixtures before starting to paint and refix in position undamaged on completion.

1.4.9 Marking and labelling

General

General: Mark services and equipment to provide a ready means of identification.

- Locations exposed to weather: Provide durable materials.
- Pipes, conduits and ducts: Identify and label to AS 1345.
- Cables: Label at each end to indicate the origin and destination of the cable.

Consistency: Label and mark equipment using a consistent scheme across all services elements of the project.

Operating and maintenance manuals: Provide marking an labelling text identical to the text and terminology used in operating and maintenance manuals.

Accessories

Label isolating switches and outlets to identify circuit origin.

Labels and notices

General: Select from the following materials:

- Cast metal.
- For indoor applications only, engraved two-colour laminated plastic.

- Proprietary pre-printed self-adhesive flexible plastic labels.
- Stainless steel or brass ≥ 1 mm thick with black filled engraved lettering.
- Outlets and isolating switches with removable cover plates – manufacturer's standard.

Emergency functions: To AS 1319.

Colours: Generally in conformance with AS 1345 as appropriate, otherwise black lettering on white background except as follows.

- Danger, warning labels: White lettering on red background.
- Main switch and caution labels: Red lettering on white background.

Edges: If labels exceed 1.5 mm thickness, radius or bevel the edges.

Fixing: Fix labels securely using screws, rivets, proprietary self-adhesive labels or double-sided adhesive tape.

- If labels are mounted in extruded aluminium sections, use rivets or countersunk screws to fix the extrusions.
- Use aluminium or monel rivets for aluminium labels.

Label locations: Locate labels so that they are easily seen and are either attached to, below or next to the item being marked. For accessories with readily removable cover plates, locate behind cover plates.

Label text: To correspond to terminology and identifying number of the respective item as shown on the record drawings and documents.

Lettering heights:

- Danger, warning and caution notices: ≥ 10 mm for main heading, ≥ 5 mm for remainder.
- Equipment labels within cabinets: ≥ 3.5 mm.
- Identifying labels on outside of cabinets: ≥ 5 mm.
- Isolating switches: ≥ 5 mm.
- Switchboards, main assembly designation: ≥ 25 mm.
- Switchboards, outgoing functional units: ≥ 8 mm.
- Switchboards, sub assembly designations: ≥ 15 mm.
- Other locations: ≥ 3 mm.

Operable devices: Mark to provide a ready means of identification. Include the following:

- Controls.
- Indicators, gauges, meters and the like.
- Isolating switches.
- Outlets.

Underground cable routes

Survey: Accurately record the routes of underground cables before backfilling. Include on the record drawings.

Location marking: Accurately mark the location of underground cables with route markers consisting of a marker plate set flush in a concrete base.

Markers: Place markers at each joint, route junction, change of direction, termination and building entry point and in straight runs at intervals of not more than 100 m.

Marker bases: 200 mm diameter x 200 mm deep, minimum concrete.

Direction marking: Show the direction of the cable run by means of direction arrows on the marker plate. Indicate distance to the next marker.

Plates: Brass, minimum size 75 x 75 x 1 mm thick.

Plate fixing: Waterproof adhesive and 4 brass or stainless steel countersunk screws.

Marker height: Set the marker plate flush with paved surfaces, and 25 mm above other surfaces.

Marker tape: Where electric bricks or covers are not provided over underground wiring, provide a 150 mm wide yellow or orange marker tape bearing the words '*WARNING – electric cable buried below*', laid in the trench 150 mm below ground level.

1.4.10 Operation and maintenance manuals

General

General: Submit operation and maintenance manuals for installations.

Authors and compilers: Personnel experienced in the maintenance and operation of equipment and systems installed, and with editorial ability.

Referenced documents: If referenced documents or technical worksections require that manuals be submitted, include corresponding material in the operation and maintenance manuals.

Subdivision: By installation or system, depending on project size.

Date for draft submission: 2 weeks prior to commencement of training or 4 weeks prior to the date for practical completion, whichever is earlier, for consultant review and familiarisation by the principal's staff. Include provisional record drawings, preliminary performance data and temporary insertions for items which cannot be finalised until the installation is tested and commissioned.

Progressive: For equipment put into service during construction and operated by principal, submit manuals within 2 weeks after acceptance.

Date for final submission: Within 2 weeks after practical completion. Incorporate feedback from reviews and from training of the principal's staff, including additional data and instruction determined. Revise and resubmit electronic copies and submit updated CD similarly.

Contents

General: Include the following:

- Certificates:
    - Certificates from authorities.
    - Copies of manufacturers' warranties.
    - Product certification.

- Directory: Names, addresses, and telephone and facsimile numbers of principal consultant, subconsultants, contractor, subcontractors and names of responsible parties.
- Drawings:
    - Record drawings, full size.
    - Drawings and technical data: As necessary for the efficient operation and maintenance of the installation.
- Equipment descriptions:
    - Name, address and telephone and facsimile numbers of the manufacturer and supplier of items of equipment installed, together with catalogue list numbers.
- Schedules (system by system) of equipment, stating locations, duties, performance figures and dates of manufacture. Provide a unique code number cross-referenced to the record and diagrammatic drawings and schedules, including spare parts schedule, for each item of equipment installed.
- Switchboard and communications frame/patchpanel schedules.
- Maintenance procedures:
    - Detailed recommendations for preventative maintenance frequency and procedures.
    - Manufacturer's technical literature as appropriate. Register with manufacturer as necessary. Retain copies delivered with equipment.
    - Safe trouble-shooting, disassembly, repair and reassembly, cleaning, alignment and adjustment, balancing and checking procedures. Provide logical step-by-step sequence of instructions for each procedure.
    - Schedule of spares recommended to be held on site, being those items subject to wear or deterioration and which may involve the principal in extended deliveries when replacements are required. Include complete nomenclature and model numbers, and local sources of supply.
- Operation procedures:
    - Manufacturers' technical literature as appropriate.
    - Table of contents: For each volume. Title to match cover.
    - Installation description: General description of the installation.
    - Systems descriptions: Technical description of the systems installed, written to ensure that the principal's staff fully understand the scope and facilities provided. Identify function, normal operating characteristics, and limiting conditions.
- Systems performance: Technical description of the mode of operation of the systems installed.
- Environmental performance: To recognise, guide and encourage building users to achieve the efficiencies and environmental performance envisaged, provide a simple guide covering an overview of the services and the energy and environmental strategy, monitoring, targeting, expansion, refurbishment and occupant considerations and requirements.
- Equipment descriptions:

- Manufacturers' technical literature for equipment installed, assembled specifically for the project, excluding irrelevant matter. Mark each product data sheet to clearly identify specific products and component parts used in the installation, and data applicable to the installation.
- Supplements to product data to illustrate relations of component parts. Include typed text as necessary.

- Operation procedures:
  - Safe starting up, running in, operating and shutting down procedures for systems installed. Include logical step-by-step sequence of instructions for each procedure.
  - Control sequences and flow diagrams for systems installed.
- Legend for colour-coded services.
- Schedules of fixed and variable equipment settings established during commissioning and maintenance.
- Maintenance procedures:
  - Schedule of normal consumable items, local sources of supply, and expected replacement intervals up to a running time of 40 000 hours. Include lubricant and lubrication schedules for equipment.
  - Instructions for use of tools and testing equipment.
- Emergency procedures, including telephone numbers for emergency services, and procedures for fault finding.
- Material safety data sheets (MSDS).
- Maintenance records:
- Documentation to AS 1851 clause 18.2.5.
- Certificates:
  - Copies of test certificates for the installation and equipment used in the installation.
  - Test reports.
  - Certificates of Electrical Safety.
- Drawings:
  - Single line diagrams.
  - Service route layouts.
  - Switchgear and controlgear assembly circuit schedules including electrical service characteristics, controls and communications.

Format – electronic copies

Printing: Provide material that can be legibly printed on A4 size paper.

Scope: Provide the same material as documented for hardcopy in electronic format.

Format: All drawings, text and documents shall be converted to and produced in a single, indexed (with page numbers referenced) PDF file (Version 7.0 or later) on CD. Where manufacturers' or other documentation is not available in electronic format, scan the images at minimum resolution 200dpi and combine in a single file with the other details.

Quantity: Refer to Electronic submissions.

Format – hard copy

General: A4 size loose leaf, in commercial quality, 4 ring binders with hard covers, each indexed, divided and titled. Include the following features:

- Cover: Identify each binder with typed or printed title '*OPERATION AND MAINTENANCE MANUAL*', to spine. Identify title of project, volume number, volume subject matter, and date of issue.
- Dividers: Durable divider for each separate element, with typed description of system and major equipment components. Clearly print short titles under laminated plastic tabs.
- Drawings: Fold drawings to A4 size and accommodate them in the binders so that they may be unfolded without being detached from the rings. Provide with reinforced punched binder tabs.
- Pagination: Number pages.
- Ring size: 50 mm maximum, with compressor bars.
- Text: Manufacturers' printed data, including associated diagrams, or typewritten, single-sided on bond paper, in clear concise English.

Number of copies: 4.

1.4.11 Record drawings

General

General: Submit record drawings. Show the 'as installed' locations of building elements, plant and equipment. Include 'as installed' amendments to shop drawings. Show off-the-grid dimensions where applicable.

Date for submission: Within 2 weeks after practical completion.

Content: Show dimensions, types and location of the services in relation to permanent site features and other underground services. Show the spatial relationship to building structure and other services. Include all changes made during commissioning and the maintenance period.

Drawings: Include all documented shop drawings.

Extensions and/or changes to existing: If a drawing shows extensions and/or alterations to existing installations, include sufficient of the existing installation to make the drawing comprehensible without reference to drawings of the original installation.

Accuracy

Documents: Incorporate all modifications made during the progress of the work and testing period. Show any provisions for the future.

Endorsement: Sign and date all record drawings. Keep one set of shop drawings on site at all times expressly for the purpose of marking changes made during the progress of the works.

Drawing layout

General: Use the same borders and title block as the contract drawings.

Quantity and format

General: Refer to Submissions.

1.4.12 Tools and spare parts

Tools and spare parts schedule

General: At least 8 weeks before the date for practical completion, submit a schedule of tools, portable instruments and spare parts necessary for maintenance of the installation. For each item state the recommended quantity and the manufacturer's current price. Include the following in the prices:

- Checking receipt, marking and numbering in accordance with the spare parts schedule.
- Packaging and delivery to site.
- Painting, greasing and packing to prevent deterioration during storage.
- Referencing equipment schedules in the operation and maintenance manuals.
- Suitable means of identifying, storing and securing the tools and instruments. Include instructions for use.

Spares

General: Provide spare parts listed in the appropriate worksections.

Replacement: Replace spare parts consumed during the maintenance period.

1.4.13 Commissioning

Circuit protection

General: Confirm that circuit protective devices are sized and adjusted to protect installed circuits.

Controls

General: Calibrate, set and adjust control instruments, control systems and safety controls.

Environmental performance

General: Calibrate, set, tune and adjust environmental and energy control systems.

Notice

General: Give notice for inspection to be made of the commissioning of the installation.

Reports

General: Submit reports indicating observations and results of tests and compliance or non-compliance with requirements.

1.4.14 Cleaning

General

General: Before practical completion, clean throughout, including all exterior and interior surfaces except those totally and permanently concealed from view.

Practical completion: At practical completion, clean the following:

- Insides of switchgear and controlgear assemblies.
- Luminaires.
- Switchgear and contactors, and other electrical contacts. Adjust as necessary.

Labels: Remove all labels not required for maintenance.

1.4.15 Completion

Samples

General: Remove unincorporated samples on completion.

Warranties

General: Name the Principal as warrantee in conformance with the Warranty schedule. Register with manufacturers as necessary. Retain copies delivered with components and equipment.

Commencement: Commence warranty periods at practical completion or at acceptance of installation, if acceptance is not concurrent with practical completion.

Approval of installer: If installation is not by manufacturer, and product warranty is conditional on the manufacturer's approval of the installer, submit the manufacturer's written approval of the installing firm.

1.4.16 Completion tests

General

General: Test the works under the contract to demonstrate compliance with the specified performance requirements.

Functional checks

General: Carry out functional and operational checks on energised equipment and circuits and make adjustments for the correct operation of safety devices.

Proprietary equipment

General: Submit type test reports confirming compliance of proprietary equipment.

Thermographic surveys

General :Undertake a thermographic survey of all busbars, equipment, terminations and connections in all switchboards.

Specialist: Tests shall be performed by an independent specialist.

Timing: Perform testing just prior to practical completion when all loads are connected and again just prior to the end of the maintenance period.

Reports: Submit photographic evidence of any hot spots detected with a comprehensive report which includes ambient and load conditions under test. Rectify any defects found and re-survey prior to submitting final reports.

Sound pressure level measurements

Correction for background noise: To AS/NZS 2107 Table B1.

External: To AS 1055.1.

Internal: To AS/NZS 2107.

Measurement positions: If a test position is designated only by reference to a room or space, do not take measurements less than 1 m from the floor, ground or walls.

Sound pressure level analysis: Measure the sound pressure level and the background sound pressure level over the full range of octave band centre frequencies from 31.5 Hz to 8 kHz at the designated positions.

Sound pressure levels: Measure the A-weighted sound pressure levels and the A-weighted background sound pressure levels at the designated positions.

Test instruments

General: Use instruments calibrated by a registered testing authority.

1.4.17 Training

General

Duration: Instruction to be available for the whole of the commissioning and running-in periods.

Format: Conduct training at agreed times, at system or equipment location. Also provide seminar instruction to cover all major components comprising a minimum of 8 hours tuition covering both operational and maintenance aspects of the installations.

Operation and maintenance manuals: Use items and procedures listed in the final draft operation and maintenance manuals as the basis for instruction. Review contents in detail with the principal's staff.

Certification: Provide written certification of attendance and participation in training for each attendee. Provide register of certificates issued.

Demonstrators

General: Use only qualified manufacturer's representatives who are knowledgeable about the installations.

Maintenance

General: Explain and demonstrate to the principal's staff the purpose, function and maintenance of the installations.

Operation

General: Explain and demonstrate to the principal's staff the purpose, function and operation of the installations.

1.4.18 Maintenance

General

General: During the maintenance and defects liability periods, carry out periodic inspections and maintenance work as recommended by manufacturers of supplied equipment, and promptly rectify faults.

Emergencies: Attend emergency calls promptly.

Minimum maintenance: Carry out the following maintenance procedures during and at the end of the maintenance period:

- Replacement of faulty lamps and accessories – monthly.
- Switchgear operation – bi-annually.
- Operation, setting and calibration checks of all controls – bi-annually.
- Submain cabling excessive temperature checks – quarterly.
- Thermographic survey – annually.
- Replacement of faulty speakers, strobes, WIPs and connectors – bi-monthly.
- EWIS as per AS 1851 and include testing of the voice instruction to evacuate the fire-affected floor and the phase delays for voice instruction to other floors.
- Annual test of interconnection of all fire and safety systems for correct operation under automatic alarm (not simulation).
- Emergency control organisation and procedures – undertake annual simulation of evacuation procedures, review fire warden procedures and confirm to persons with disabilities who use the buildings the operation of the lifts under fire mode.
- Operation, setting and calibration checks of all controls – bi-annually.

Maintenance program

General: Submit details of maintenance procedures and program, relating to installed plant and equipment, 6 weeks before the date for practical completion. Indicate dates of service visits. State contact telephone numbers of service operators and describe arrangements for emergency calls.

Maintenance records

General: Submit, in binders which match the manuals, loose leaf log book pages designed for recording completion activities including operational and maintenance procedures, materials used, test results, comments for future maintenance actions and notes covering the condition of the installation. Include completed log book pages recording the operational and maintenance activities performed up to the time of practical completion.

Certificates: Include test and approval certificates.

Certification: On satisfactory completion of the installation, submit certificates stating that each installation is operating correctly.

Number of pages: The greater of 100 pages or enough pages for the maintenance period and a further 12 months.

Referenced documents: If referenced documents or technical worksection s require that log books or records be submitted, include this material in the maintenance records.

Service visits: Record comments on the functioning of the systems, work carried out, items requiring corrective action, adjustments made and name of service operator. Obtain the signature of the principal's designated representative.

Reviews

Allow for quarterly reviews of the commissioning during the defects' period and a final recommission after 12 months of operation.

Site control

General: Report to the principal's designated representative on arriving at and before leaving the site.

1.5 Selections

1.5.1 Warranty schedule

Warranty	Form	Period
Balance of works – new equipment and installations	Parts and labour	1 year
Balance of works – existing equipment and installations	Parts and labour	1 year

1.5.2 Electrical systems schedule

Electrical systems required
Low voltage power systems
Cable support and duct systems
Switchboards – proprietary
Switchboard components
Lighting
Luminaires
Emergency evacuation lighting systems

2. Wiring and Accessories

2.1.1 Cross references

General

General: Conform to the *General requirements (electrical)* worksection.

Associated worksections

Associated worksections: Conform to the following:

- *Switchboards.*
- *Power factor correction.*
- *Lighting.*

2.1.2 Standards

General

General: AS/NZS 3000.

Electrical equipment: To AS/NZS 3100.

Selection of cables: To AS/NZS 3008.1.1.

Distribution cables: To AS/NZS 4961.

Cable trunking systems: To AS/NZS 4296.

Conduits and fittings for electrical installations: AS/NZS 3750.9

Testing

Standard: To AS/NZS 3017.

2.1.3 Interpretations

Abbreviations

General: For the purposes of this worksection the abbreviations given below apply.

- HDPE: High Density Poly Ethylene
- HDPVC: High Density Poly Vinyl Chloride
- MIMS: Mineral-insulated metal-sheathed.
- PVC: Poly Vinyl Chloride
- XLPE: Cross Linked Poly Ethylene

Definitions

General: For the purposes of this worksection the definitions given below apply.

- Extra-low voltage: Not exceeding 50 V a.c. or 120 V ripple-free d.c.

- Low-voltage: Exceeding extra-low voltage, but not exceeding 1000 V a.c. or 1500 V d.c.
- High voltage: Exceeding low-voltage.

2.1.4 Submissions

Mains and sub-main cable routes on the current architectural background coordinated with ceilings, structure and other services.

General: Submit shop drawings showing the following:

- Cable tray and trunking routes.
- Layout of cable supports and enclosures on the current architectural background coordinated with the structure and other services.
- Layout of underground conduits, pits and drainage trenches.
- Invert levels for underground conduits.
- Depth of burial for cables and conduits.
- In situ pits.
- Provision for expansion and ground movement.
- Fabricated columns.
- Footing for columns.

Technical data

General: Submit technical data for the following:

- Ducted wiring enclosure systems.
- Cable support systems.
- Proprietary pits.
- Proprietary columns.

Power cable ratings calculations

General: If cable sizes are not given, submit calculations of current ratings and voltage drop.

Standard: To AS/NZS 3008.1.1.

Samples

Submit samples of lighting switchplates, outlet boxes, wall mounted accessories, PIR/PE cells.

2.2 Wiring systems

General

Selection: Provide wiring systems appropriate to the installation conditions and the function of the load.

2.2.1 Power cables Selections

Standard

PVC and XLPE cables: To AS/NZS 5000.1.

Cable

General: Select multi-stranded copper cable generally, except for mineral insulated metal sheathed (MIMS).

Minimum size:

- Lighting sub-circuits: 6 mm^2.
- Power sub-circuits: 2.5 mm^2 (4 mm^2 (in conduits) in walls with bulk insulation).
- Sub-mains: 35 mm^2.

Voltage drop: Select final subcircuit cables within the voltage drop parameters dictated by the route length and load.

Fault loop impedance: Select final subcircuit cables selected to satisfy the requirements for automatic disconnection under short circuit and earth fault/touch voltage conditions.

Underground residential distribution systems: Select cables according to AS/NZS 4026.

Distribution cables: To AS/NZS 4961.

Cable sizes: If cable sizes are not given, submit calculations of current ratings and voltage drop.

Ratings: Install single-core and multi-core PVC/PVC, XLPE/PVC, MIMS and fire-resistant polymer insulated and sheathed cable mains/submains to achieve ratings not less than the following for the conductors nominated:

- multi-core cable to the unenclosed-in-air ratings of Tables 12, 13 and 14 Column 2 AS 3008.1.1;
- single-core cables to the unenclosed-in-air ratings of Tables 6 and 7 Column 4 and Table 8 Column 3 AS 3008.1.1;
- single-core cables to the underground duct ratings of Tables 6 and 7 Column 16 and Table 8 Column 9 AS 3008.1.1;
- bare single-core MICS cables to the unenclosed-in-air ratings of Table 18 Column 6.

Where the required setting or rating of protection devices for discrimination and coordination necessitates higher cable ratings than those indicated or calculated on the basis of installation and voltage drop requirements, provide the higher rated cables without cost variation to the contract.

Conductor colours

General: For fixed wiring, provide coloured conductor insulation. If this is not practicable, slide at least 150 mm of close fitting coloured sleeving on to each conductor at the termination points.

Active conductors in single phase circuits: Red.

Active conductors in polyphase circuits:

- A phase: Red.
- B phase: White.

- C phase: Blue.

2.2.2 Power cables

General

Standard: Classifications to AS/NZS 3013.

Handling cables: Report damage to cable insulation, serving or sheathing.

Stress: Ensure that installation methods do not exceed the cable's pulling tension. Use cable rollers for cable installed on tray/ladders or in underground enclosures.

Straight-through joints: Unless unavoidable due to length or difficult installation conditions, run cables without intermediate straight-through joints.

Cable joints: Locate in accessible positions in junction boxes.

Extra-low voltage circuits: Individual wiring of extra-low voltage circuits: Tie together at regular intervals.

Tagging

General: Identify multicore cables and trefoil groups at each end with stamped non-ferrous tags clipped around each cable or trefoil group.

Marking

General: Identify the origin of all wiring by means of legible indelible marking.

2.2.3 Mineral insulated metal sheathed cable (mims)

General

General: Maintain manufacturer's seals until joint or termination is made. Remove moisture by heating cable ends.

Seals

Temporary seals: Fit temporary seals to the open ends of cables cut and not immediately used.

Terminations: Fit termination seals at ends of cable runs as soon as the cable has been cut to length, stripped back, and the moisture driven out.

Through joints: Same fire-rating as the cable.

Sheath earthing

General: If MIMS cables enter metal enclosures, earth sheaths to non-ferrous plates secured to the enclosures. Where sheaths terminate at plates, fully insulate, colour code, and fix the conductors to the enclosures.

Bonding

General: Bond metal sheaths of single core cables in multi-phase circuits with proprietary earth bonding clips or clamps.

Separation

General: Separate MIMS cables from tough plastic sheathed (TPS) cables and UPVC conduits by at least 25 mm.

Eddy currents

General: Arrange single core cable entries into non-ferrous metal gland plates to minimise eddy currents.

Vibration

Connections with vibrating equipment: Loop cables in a complete circle next to the point of connection.

MIMS cable terminations

MIMS cable systems: Test the insulation resistance as follows:

- At the time of termination.
- 24 hours later.

2.2.4 Fire-rated (other than mims)

Protection

General: If exposed to mechanical damage, provide protection to AS/NZS 3013.

2.2.5 Copper conductor terminations

General

General: Other than for small accessory and luminaire terminals, terminate copper conductors to equipment, with compression-type lugs of the correct size for the conductor. Compress using the correct tool or solder.

Within assemblies and equipment

General: Loom and tie together conductors from within the same cable or conduit from the terminal block to the point of cable sheath or conduit termination. Neatly bend each conductor to enter directly into the terminal tunnel or terminal stud section, allowing sufficient slack for easy disconnection and reconnection.

Alternative: Run cables in UPVC cable duct with fitted cover.

Identification: Provide durable numbered ferrules fitted to each core, and permanently marked with numbers, letters or both to suit the connection diagrams.

Spare cores: Identify spare cores and terminate into spare terminals, if available. Otherwise, neatly insulate and neatly bind the spare cores to the terminated cores.

2.2.6 Aluminium conductor terminations

General

Do not use aluminium conductors generally. Where existing conductors are to be retained comply with the following.

Conductor surface preparation: Remove oxide as follows:

- Wire brushing surfaces to be connected.
- Immediately applying oxidation inhibiting abrasive grease containing zinc or similar particles. Thoroughly cover the surfaces and work the grease between the strands of stranded conductors.

Fittings: Unless joint contact surfaces are factory tinned or factory pre-filled with oxidation inhibiting abrasive grease, prepare as for conductors.

Aluminium-to-aluminium jointing

Compression method:

- Provide aluminium or aluminium alloy crimp lugs or ferrules selected to suit the size and shape of the conductors.
- Use compression dies selected to suit lugs or ferrules, with hexagonal dies for stranded conductors and indent dies for solid conductors.
- Fill lugs or ferrules with oxidation inhibiting abrasive grease.
- Insert conductors into lugs or ferrules, driving out excess grease.
- Apply dies to provide at least 2 indentations at each joint or termination.

Fusion weld method: Make joints by fusion welding with aluminium lugs. Protect cable insulation from heat by fixing substantial heat sinks to the cable near the joint. After completion of the weld, wire brush the joint and file sharp projections smooth.

Aluminium-to-copper jointing

Method: Use compression method, as for Aluminium-to-aluminium jointing.

Connector types: Select from the following:

- Bi-metal: Lug or pin type with cast copper palm or pin, friction welded to an aluminium barrel section, subsequently factory filled with oxidation inhibiting abrasive grease.
- Case electro-tinned aluminium lug: Bolt the palm of the lug to the copper busbar or terminal by means of a stainless steel bolt and nut with a large diameter stainless steel flat washer and a spring cup washer.

2.2.7 Cable Installation

General

Fixing: If non-structural building elements are not suitable for fixing equipment and services to, fix directly to structure and trim around holes or penetrations in non-structural elements.

Installation: Install equipment and services plumb, fix securely and organise reticulated services neatly. Allow for movement in both structure and services.

Concealment: Conceal all cables, ducts, trays, pipes etc unless installed in plant spaces, ceilings, riser cupboards, etc or unless otherwise detailed.

Lifting: Provide heavy items of equipment with permanent fixtures for lifting as recommended by the manufacturer.

Suspended ground floors: Keep all parts of services under suspended ground floors > 150 mm clear of the ground surface. Make sure services do not impede access.

Arrangement: Arrange services so that services running together are parallel with each other and with adjacent building elements.

2.2.8 Unsheathed cables – installation

General

General: Provide permanently fixed enclosure systems, assembled before installing wiring. Provide draw wires to pull in conductor groups from outlet to outlet, or provide ducts with removable covers.

Cable systems

Systems: Provide the following:

- Accessible concealed spaces: Thermoplastic insulated and sheathed cables.
- Inaccessible concealed spaces: Cable in UPVC conduit.
- Plant rooms: Cable in heavy duty UPVC conduit, or on tray or in duct.
- Plastered or rendered surfaces: Cable in UPVC conduit.
- Stud walls without bulk insulation: Thermoplastic insulated and sheathed cables.
- Walls filled with bulk thermal insulation: Cables in PVC conduit.

Differential movement

General: If the geotechnical site investigation report predicts differential movements between buildings and the ground in which conduits are buried, provide movement control joints in the conduits.

- Location: Adjacent to the conduit supports which are closest to the perimeter of the building.
- Arrangement: Arrange conduits to minimise the number of movement control joints.
- Magnitude: Accommodate the predicted movements.

Holes and chases

General: If holes and chases are required in masonry walls, provide proposals to demonstrate that the structural integrity of the wall is maintained. Do not chase walls nominated as fire rated or acoustic. Parallel chases or recesses on opposite faces of a wall shall not be closer than 600 mm to each other.

Chasing of blockwork: Only in core-filled hollow blocks or in solid blocks which are not designated as structural or where there are restrictions on chasing, etc. intended to limit sound transmission (e.g. BCA) and shall be to the Concrete blockwork chasing table.

Concrete blockwork chasing table

Block thickness (mm)	Depth of chase (maximum mm)
190	35
140	25

Block thickness (mm)	Depth of chase (maximum mm)
90	20

Penetrations

Fire rated building elements: Seal penetrations with a system conforming to AS 4072.1.

Non-fire rated building elements: Seal penetrations around conduits and sleeves. Seal around cables within sleeves. If the building element is acoustically rated, maintain the rating.

Sleeves

- General: If piping or conduit penetrates building elements, provide metal or UPVC sleeves formed from pipe sections as follows:
- Movement: Arrange to permit normal pipe or conduit movement.
- Diameter (for non fire-rated building elements): Sufficient to provide an annular space around the pipe or pipe insulation of at least 12 mm.
- Prime paint ferrous surfaces.
- Terminations:
    - If cover plates are fitted: Flush with the finished building surface.
    - In fire-rated and acoustic-rated building elements: 50 mm beyond finished building surface.
    - In floors draining to floor wastes: 50 mm above finished floor.
    - Elsewhere: 5 mm beyond finished building surface.
- Termite management: To AS 3660.1.
- Thickness:
- Metal: ≥ 1 mm.
- UPVC: ≥ 3 mm.

Sleeves for cables

General: For penetrations of cables not enclosed in conduit through ground floor slabs, beams and external walls provide sleeves formed from UPVC pipe sections.

- MIMS cables: Provide sleeves for penetrations through masonry.

2.3 Cable support and duct systems

General

2.3.1 Aims

Responsibilities

General: Provide cable support and duct systems as documented.

2.3.2 Cross references

General

General: Conform to the *General requirements (electrical)* worksection.

2.3.3 Conduits Product

Conduits

Type

General: Rigid.

Sizes

Conduits: ≥ 20 mm.

Colour

Underground Power Conduits: Orange

2.3.4 Metallic conduits and fittings

Standard

Metallic conduits and fittings: AS/NZS 2053.7 or AS/NZS 2053.8.

Type

General: Screwed steel.

Corrosion protection

Steel conduits: Paint ends and joint threads with zinc rich organic primer to AS/NZS 3750.9.

2.3.5 Non-metallic conduits and fittings

General

Standards: Non-metallic conduits and fittings: AS/NZS 2053 Parts 2, 3, 4, 5 or 6.

Flexible conduit

General: Provide flexible conduit to connect with equipment and plant subjected to vibration. If necessary, provide for adjustment or ease of maintenance. Provide the minimum possible length.

Associated fittings

Type: The same type and material as the conduit.

Wall boxes on UPVC conduits: For special size wall boxes not available in UPVC, provide prefabricated earthed metal boxes.

Inspection fittings

General: Provide inspection-type fittings only in accessible locations and where exposed to view.

Joints

Type: Cemented or snap on joints.

2.3.6 Ducted wiring enclosures

Ducting

General: Provide purpose-made ducts, skirting ducts and floor ducts, incorporating segregation where used for multiple services. Provide rigid supports. Round off sharp edges and provide bushed or proprietary cable entries into metallic ducting.

Accessories

General: Provide purpose-made accessories and covers to match the duct system. Provide screw-fixed covers or clip-on covers removable only with the use of tools.

Cable support: Except for horizontal runs where the covers are on top, support wiring with retaining clips at intervals of not more than 1000 mm.

Outlet mounting: Centre mount outlets (power, voice and data) where possible (e.g. new ducts).

Corner protection angles: Provide protection angle inserts at duct corners (both internal and external corners) to assist in maintenance of Cat. 5 and/or 6 communications wiring bending radius requirements.

2.3.7 Cable tray/ladder support systems

General

System: Provide a complete cable support system consisting of trays or ladders and including brackets, fixings and accessories to the Wiring enclosures and cable support systems schedule and the following.

Finish: Hot dipped galvanized.

Manufacture: Provide proprietary trays, ladders, fittings and accessories from a single manufacturer for the same support system.

Cable ladders: Run cables < 13 mm diameter on cable trays or in ducts.

2.3.8 Catenary systems

General

Catenary systems: May be used within suspended ceiling spaces in lieu of cable tray and ladder systems.

Wire: Provide stainless steel cable and couplings for catenary systems.

2.3.9 Cable pits

General

Cable draw-in pits: Provide. Sizes given are internal dimensions.

Proprietary cable pits

Pits ≤ 1200 x 1200 mm: Provide proprietary concrete or polymer moulded pits.

In situ construction

Pits > 1200 x 1200 mm: Provide either:

- Proprietary cable pits.
- Construct walls and bottoms from rendered brickwork or 75 mm thick reinforced concrete. Incorporate a waterproofing agent in the render or concrete.

Pit covers

General: Provide pit covers to suit external loads. Fit flush with the top of the pit.

Standard: To AS 3996.

Weight: < 40 kg for any section of the cover.

Lifting handles: Provide a lifting handle for each size of cover section.

Drainage

General: Provide drainage from the bottom of cable pits, either to absorption trenches filled with rubble or to the stormwater drainage system.

Absorption trenches: Minimum size 300 x 300 x 2000 mm.

2.3.10 Columns

General

Columns: Conform to the following for fabricated columns more than 2400 mm high which are designed to support accessories outdoors.

Design

General: Provide columns designed, manufactured and tested by a specialist manufacturer.

Dimensions: To AS 1798.

Construction

General: Hot dip galvanize columns and fittings after fabrication.

Bases: Provide columns with mounting bases for fixing to reinforced concrete footings.

Accessory mountings: Provide adjustable mountings, to suit accessories. Include provision for rigidly clamping each item in position, once adjusted correctly.

Maintenance access: Provide pole stirrups secured to either side of the column for access to accessories. Locate the first stirrup ≥ 3 m above ground level.

Electrical connections: Provide a recess fitted with a flush mounted cover at the base of the column for access to cable connections and equipment.

Cable support: For connections higher than 3 m provide a catenary wire cable support system.

2.3.11 Conduit systems – installation

Set out

General: If exposed to view, install conduits in parallel runs with right angle changes of direction.

Bends

General: Install conduits with the equivalent of ≤ 2 right angled bends per cable draw-in run.

Conduits in roof spaces:

General: Locate below roof insulation and sarking. In accessible roof spaces, provide mechanical protection for light-duty conduits.

Inspection fittings

General: Locate in accessible positions.

Draw cords

General: Provide 5 mm^2 polypropylene or 3mm diameter galvanised steel wire draw cords in conduits not in use.

Draw-in boxes

General: Provide draw-in boxes as follows:

- Spacing: < 30 m.
- At changes of level or direction.

Underground draw-in boxes: Provide casketed covers and seal against moisture.

Expansion

General: Allow for thermal expansion/contraction of conduits and fittings due to changes in ambient temperature conditions. Provide expansion couplings as required.

Rigid conduits

General: Provide straight long runs, smooth and free from rags, burrs and sharp edges. Set conduits to minimise the number of fittings.

Routes

General: Run conduits concealed in wall chases, embedded in floor slabs or installed in inaccessible locations directly between points of termination, minimising the number of sets. Do not provide inspection fittings.

Conduits in concrete slabs

Route: Do not run in concrete toppings. Do not run within pretensioning cable zones. Cross pretensioning cable zones at right angles. Route to avoid crossovers and minimise the number of conduits in any location. Space parallel conduits ≥ 50 mm apart.

Minimum cover: The greater of the conduit diameter and 20 mm.

Fixing: Fix directly to top of the bottom layer of reinforcing.

Hollow-block floors

Locate conduits in the core-filled sections of precast hollow-block type floors.

Columns

Conduits in columns:

- ≤ 4 per column.
- ≤ 25 mm diameter.
- Locate conduits centrally in each column.

Bends: Enter columns via ≥ 150 mm radius bends. Do not use elbows.

Chasing: Do not chase columns.

2.3.12 Cable tray/ladder support systems – installation

Fixing to building structure

General: Fix supports to the building structure or fabric by means of ≥8 mm threaded rod hangers attached to hot dipped galvanized U-brackets, or by means of proprietary brackets.

Cable fixing

General: Provide strapping or saddles suitable for fixing cable ties.

MIMS cables: provide non-magnetic straps.

Bend radius

General: Provide bends with an inside radius ≥ 12 times the outside diameter of the largest diameter cable carried.

Cable protection

General: Provide rounded support surfaces under cables where they leave trays or ladders.

Access

General: Locate trays and ladders to provide ≥ 150 mm free space above and ≥ 600 mm free space on at least one side.

Routes

Tray and ladder routes, where shown on drawings, shall be considered minimum requirements only. Provide additional trays and ladder as required for cable supports using the installation methods

specified to avoid de-rating of cables and to maintain segregation between LV and ELV (i.e. data, voice, broadband, EWIS, security, fire alarm, BAS, etc.) wiring systems.

Clearances

From hot water pipes: > 200 mm.

From boilers or furnaces: > 500 mm.

EMI: Locate support systems for electrical power cabling and communication cabling to minimise electromagnetic interference.

2.3.13 Catenary systems – installation

General

Anchoring: Anchor catenary systems to the structure. Do not fix to any part of a suspended ceiling system.

Design loads: Provide catenary systems designed to support the proposed load of the cables with a spare capacity of 50% loading.

Fixing: Fix cables to the catenary system such that no cable is under stress due to tension or compression. Use proprietary fixings that allow cables to be added or removed without destroying the integrity of the system.

2.3.14 Cables in trenches – installation

Sand bed and surround

General: Provide clean sharp sand around cables and conduits installed underground.

Sealing ducts and conduits

General: Seal buried entries to ducts and conduits with waterproof seals. Seal spare ducts and conduits immediately after installation. Seal other ducts and conduits after cable installation.

2.3.15 Columns – installation

General

General: Install columns as documented including the provision of in situ reinforced concrete footings to the Wiring enclosures and cable support systems schedule.

2.3.16 Wiring enclosures and cable support systems schedule

Cable trays

Manufacturer	Burndy, Denco, Ezystrut
Type	Ladder tray systems with punched integral slotted rungs and side rails and ‘Admiralty pattern’ tray with reverse stamped perforations

Material	Press formed metal
Finish	To AS 1397 for hot dipped zinc-coated and aluminium/zinc coated sheet steel and strip
Tray dimensions	
-Usable width	50% increase beyond initial requirements allowing for cable spacing without de-rating
-Usable depth	19mm for subcircuit trays, 45mm for submains or where cable loads exceed 20kg per metre
-Minimum thickness	< 150mm wide: 1mm base metal thickness (BMT) ≥ 150mm < 300mm wide: 1.2mm BMT ≥ 300mm wide: 1.6mm BMT
-Unit length	Ladder tray 3m, cable tray 2.4m
-Connector type and material	Per manufacturer's standard
Supports	Trapeze (double-sided hanger) type. Single centre supports are not permitted

Cable ladders

Manufacturer	Burndy, Denco, Ezystrut
Material	Steel or aluminium
Finish	Hot dipped galvanized steel or extruded structural grade aluminium
Coating	Where exposed externally, hot dipped galvanized with a protective coating or 'marine grade' aluminium
Dimensions	
Usable depth	45mm minimum
Usable width	50% increase beyond initial requirements allowing for cable spacing without de-rating
Minimum thickness	Manufacturer's standard for medium duty (NEMA 2)
Unit length	3m or 6m

Rung	
Spacing	300mm maximum
Type	Perforated with 50% of its surface area open for air circulation
Connector type and material	Manufacturer's standard – metal
Fixing to building structure	Direct fixing double-sided (trapeze) type hangers or brackets (single centre supports not permitted)
Cable fixing	
-Type	Proprietary cable clamps generally

Catenary systems

Maximum number of cables permitted to be supported by a catenary system	
-Lighting circuits	6
-Socket outlet circuits	6

Columns

Type	Fabricated/proprietary
Height	Refer Landscape Architects drawings as required
Sections/dimensions	Refer Landscape Architects drawings as required
Footing type/dimensions	Refer structural engineering drawings and specifications
Colour/finish	Painted in colour as selected after galvanizing
Material	Refer Landscape Architects drawings as required

2.4 Earthing

Earthing systems

Standard: Provide an earthing system.

Type: Multiple earthed neutral (MEN) system using a driven copper or copper and stainless steel electrode (refer below for corrosive soil) or series of electrodes to the approval of the local electricity Distributor.

Communications applications: Provide earthing systems for communications applications complying with AS/ACIF S009.

Electrodes

General: Provide electrodes to suit soil resistivity.

Corrosive soil: Do not use stainless steel electrodes.

Earth and bonding clamps

General: Provide proprietary earthing and bonding clamps.

Standard: To AS 1882.

Footings and pipes: Bond to the building footings and metallic incoming services entry pipes.

2.5 Accessories

2.5.1 General

General: Conform to the following and as documented.

Conformity: All accessories and outlets located in close proximity are to be the same manufacture, size and material if available.

2.5.2 Installation of accessories

General: Install accessories in conformance with the Installation of accessories table.

Flush mounting: Provide flush mounted accessories except in plant rooms.

Location: Final location of all outlets and equipment to be confirmed on site prior to installation.

Default mounting heights to centre of accessory plate:

Outlets	300 mm
Switches and controls	1100 mm

Restricted location: Do not install wall boxes across junctions of wall finishes.

Surface mounting: Proprietary mounting blocks.

Installation of accessories table

Wall construction	Installation and concealed cabling facilities
Rendered masonry partition	Flush wall box with conduit chased into wall
Double sided face brick partition	Vertically mounted flush wall box with conduit concealed in cut bricks
Face brick external cavity wall	Flush wall box with thermoplastic insulated cables in conduit run in cavity and tied against inner brick surface, or thermoplastic sheathed cables run in cavity

Stud partition	Rewirable

2.5.3 Accessories

Standard:

- General: To AS/NZS 3112.
- Industrial: To AS/NZS 3123.

Pin arrangement: Mount outlets with the earth pins at the 6 o'clock position.

Mechanism: Construct the face plate and mechanism so that the mechanism cannot be displaced during normal operation.

Indicators: Provide red indicators above or adjacent switch toggles, to be visible with switches "on".

Types:

- Stainless steel plates with black or charcoal mechanisms in prestige areas of the floor designated by the architect and in tea-rooms/points.
- Clipsal Slimline SC2000 Series or equal HPM elsewhere in either moulded plastic or metal finishes as selected by the Architect.
- Protected IP24 type in plantrooms and industrial style wet areas (e.g. garbage bin area).

Mounting Heights: Refer architectural drawings and notes on drawings. Note that special mounting heights may be applicable for wheelchair-bound users in designated areas.

Plugs – 230/400 volt

General: Provide plugs with integral pins of the insulated type to AS/NZS 3112 for all equipment supplied and installed.

Isolating switches

Standard: To AS/NZS 3133.

Type: To control whole current to the equipment or appliance connected. As for *General purpose socket outlets* for the location identified.

Minimum rating: 20A 230 V/400 V a.c.

Special purpose power outlets (15 amp) for Comms Racks etc and direct connected with isolator for equipment shall be provided for storage hot water units, roller doors, gates, etc.

Emergency stop switches

Standard: To IEC 60947-5-5.

3-phase outlets

Construction: Surface mounted type of high-impact resistant plastic, with flap lid on the outlet.

Minimum: 20 A, 400 V a.c.

Pin arrangement: Five round pins mounted with earth pins at the 6 o'clock position, neutral pins in the centre and the red, white and blue phases in a clockwise sequence when viewed from the front of the outlet.

Plug: Provide a matching plug top for each outlet.

Installation of ceiling mounted appliances

Connections: Appliances: Provide flush mounted outlets on the ceiling next to support brackets.

Connections: Fixed equipment: Provide concealed permanent connections.

Fixing: Provide support brackets fixed through ceiling to the building structure. Brace appliances that have excessive bending moments, are heavy or vibrate, to prevent horizontal movement.

Lighting Outlets

Pin arrangement

Standard: 3 flat pin with looping terminal.

Emergency lighting: 4 flat pin if self-contained emergency lighting is to be connected.

3. Switchboards

General

3.1.1 Standards

General

Standards: To AS/NZS 3439.3.

3.1.2 Interpretations

Definitions

Proprietary assemblies: Low voltage switchgear and controlgear assemblies available as a catalogue item, consisting of manufacturer's standard layouts and equipment.

Custom-built assemblies: Low voltage switchgear and controlgear assemblies manufactured to order.

Rated currents: Rated currents are continuous uninterrupted current ratings within the assembly environment under in-service operating conditions.

Rated short-circuit currents: Maximum prospective symmetrical root mean square (r.m.s.) current values at rated operational voltage, at each assembly incoming supply terminal, excluding effects of current limiting devices.

Abbreviations

TTA: Type tested assemblies.

NTTA: Non-type tested assemblies.

PTTA: Partially type tested assemblies

3.1.3 Aims

Responsibilities

General: Provide switchboard components as follows and as documented.

3.1.4 Cross references

General

General: Conform to the General requirements (electrical) worksection.

3.1.5 Submissions

Calculations

General: Submit detailed certified calculations verifying design characteristics.

Standard: To AS 3865 and AS 4388.

Type test data

General: Submit type test certificates for components, functional units and assemblies. Verify that type tests and internal arcing-fault tests, if any, were carried out at not less than the designated fault currents at rated operational voltage.

Alterations to TTAs: Submit records of alterations made to assemblies since the tests.

Routine tests

General: Submit reports.

Shop drawings

General: Submit shop drawings showing:

- Types, model numbers and ratings of assemblies.
- Component details, functional units and transient protection.
- Detailed dimensions.
- Shipping sections, general arrangement, plan view, front elevations and cross-section of each compartment.
- Projections from the assembly that may affect clearances or inadvertent operation, such as handles, knobs, arcing-fault venting flaps and withdrawable components.
- Fault level and rated short circuit capacity characteristics.
- IP rating.
- Fixing details for floor or wall mounting.
- Front and back equipment connections and top and bottom cable entries.
- Door swings.
- External and internal paint colours and paint systems.
- Quantity, brand name, type and rating of control and protection equipment.
- Construction and plinth details, ventilation openings, internal arcing-fault venting and gland plate details.
- Terminal block layouts and control circuit identification.
- Single line power and circuit diagrams.
- Details of mains and submain routes within assemblies.
- Busbar arrangements, links and supports, spacing between busbar phases and spacing between assemblies, the enclosure and other equipment and clearances to earthed metals.
- Dimensions of busbars and interconnecting cables in sufficient detail for calculations to be performed.
- Form of separation and details of shrouding of terminals.
- Labels and engraving schedules.

3.1.6 Specific Requirements

Provide new circuit breakers in existing distribution boards to accommodate new circuits.

Balance the loads across the three phases.

3.1.7 Balancing of Loads

Balance the electrical load at each switchboard evenly, over the three phases of the supply.

The Contractor shall be responsible for the final installation having:

a) An overall power factor 0.85

b) The three phases balanced and,

c) Within limits voltage drop

All to the satisfaction of the Supply Authority.

In calculating voltage drops the current used for mains and submain cables shall be equal to the calculated maximum demand plus 20% of the rating or setting of the protective device, whichever is the lesser.

3.2 Design

Approved manufacturers

NHP, Schneider, Cutler Hammer.

Layout

Position equipment to provide safe and easy access for operation and maintenance. Consider functional relationships between items of equipment in the laying out of equipment on the assembly.

Service conditions

Normal service conditions.

Rated currents

Rated currents: Minimum continuous uninterrupted rated currents within the assembly environment, under in-service operating conditions.

Fault levels

Rated short-circuit currents: Maximum prospective symmetrical r.m.s. current values at rated operational voltage, at each assembly incoming supply terminal, excluding effects of current limiting devices.

Assembly short-circuit capacity characteristic: Rate main circuit supply and functional units as follows:

- Back-up protective device provided: Rated short-circuit current for the maximum opening time of the associated protective device.

Tested levels: Do not operate equipment at fault levels higher than tested levels, unless provided with fault current limiting back-up protection.

Statutory authority's equipment

General: Liaise with the supply authority with regard to the installation and coordinate with their protective and control equipment.

Uniformity of switchgear

General: Ensure that all switchgear and components within assemblies and sub-assemblies are of the same manufacture or brand. For example, circuit breakers on the main switchboard, generator main control and downstream distribution boards and switchboards shall be provided from a common manufacturer to ensure full coordination with discrimination.

Discrimination and coordination

General: Switchboard and distribution board assembly submains and final subcircuit protection devices shall provide complete discrimination between upstream and downstream devices. Discrimination and coordination shall be achieved for switchgear in mechanical and hydraulics assemblies and control panels in addition to the switchgear in distribution boards and switchboard assemblies specified in this worksection.

Distribution boards

The new building shall have distribution boards installed in selected locations around the market to provide electrical services.

Each board shall be a form 1 and have an IP66 degree of protection. They will be equipped with local isolation and circuit breakers necessary for connection of all submain and sub-circuit cabling required for equipment, lighting and power installation.

Residual current protection circuit breakers will be installed to distribution boards for connection of sub-circuit cabling associated with general-purpose outlets (GPO's), lighting, etc.

Generally distribution boards will be of the wall or floor mounted sheet metal cubicle type suitable for accommodation in separate electrical cupboards

Separation

Generally: Form 1 less than 200 Amps capacity.

Moulded case circuit breakers: Mount < 4 functional units within a common separated subsection.

Moulded case or miniature overcurrent circuit breakers rated up to 100 A, connected to circuits for lighting, general purpose outlets and small single or multi-phase electrical accessories: Mount any number of circuit breakers within a Form 1 separated subsection, provided the circuit breakers are mounted on an approved multi-pole busbar chassis assembly, concealed with an escutcheon panel and removable door.

Spare facilities

Provide at least 25% spare pole capacity after provision of 25% extra over RCBOs in equipped mountings.

Connection

Indoor cable entries: Top and bottom.

3.3 Switchboard Construction

3.3.1 General

General

General: Provide rigid, ventilated, insect screened enclosures, giving the documented enclosure, separation and degree of protection.

Front connected – main distribution switchboards.

Supporting structure: Front access assemblies with frontal areas < 2 m2: wall mounted.

Protection (IP) rating: IP 66 minimum.

Supply authority's equipment

General: Install equipment supplied by the supply authority, and provide wiring to complete the installation.

Tariff meter compartment: Install the retailer/supply authority's tariff metering equipment in a separated, sealed meter compartment or separate meter panel.

Layout

General: Position equipment to provide safe and easy access for operation and maintenance. Group devices according to function.

Equipment on doors: Set out in a logical manner in functional unit groups, so it is accessible without the use of tools or keys.

Segregation

General: Segregate BCA emergency equipment from non-emergency equipment by means of metal partitions designed to prevent the spread of a fault from non-emergency equipment to emergency equipment.

Enclosure materials

General: Fabricate from sheet metal of rigid folded and welded construction. Obtain approval for non-welded forms of construction.

Material: ≥ 1.6 mm thick metallic-coated sheet steel.

Coating class:

- Indoor assemblies: Z200.
- Outdoor assemblies: Z450.

Insect proofing

General: Cover ventilation openings with non-combustible and corrosion resistant 1 mm mesh.

Equipment mounting panels

General: To support the weight of mounted equipment.

Metallic panels: Construct from ≥ 3 mm thick metal with heavy metal angle supports or plates bolted or welded to enclosure sides.

Non-metallic panels: Provide non-metallic panels selected to suit the weight of the mounted equipment and design the mounting structure for stability and stiffness.

Non-metallic boards: To IEC 60893-1.

Equipment fixing

Spacing: Provide 50 mm minimum clearance between the following:

- Busbars for lifts, fire services and building emergency services.
- General installation services, busbars and equipment.

Mounting: Bolts, set screws fitted into tapped holes in metal mounting panels, studs or proprietary attachment clips. Provide accessible equipment fixings which allow equipment changes after assembly commissioning.

Installation: For lightweight equipment, provide combination rails and proprietary clips.

Earth continuity

General: Strip painted surfaces and coat with corrosion resistant material immediately before bolting to the earth bar. Provide serrated washers under bolt heads and nuts at painted, structural metal-to-metal joints.

Construction

Supporting structure: Provide concealed fixings or brackets to allow assemblies to be mounted and fixed in position without removing equipment.

3.3.2 Cable entries

General

General: Provide cable entry facilities within assembly cable zones for incoming and outgoing power and control cabling. Provide sufficient clear space within each enclosure next to cable entries to allow incoming and outgoing cables and wiring to be neatly run and terminated, without undue bunching and sharp bends.

Spare entry space: Provide 33% spare space for future cables. Refer drawings also for spare space requirements for separate busbar sections.

Cover and gland plates

Cover plates: Provide 150 mm maximum width cover plates butted together and covering the continuous cable entry slot.

Gland plates: Provide removable gland plates fitted with gaskets to maintain the degree of protection.

Materials: 1.5 mm thick steel, 5 mm thick composite material or laminated phenolic. 6 mm thick brass for MIMS cables and cable glands.

3.3.3 Doors and covers

General

Provide lockable doors with a circuit card holder.

Door layout

Maximum width: 900 mm.

Minimum swing: At least 90º.

Door stays: Provide stays to outdoor assembly doors.

Adjacent doors: Space adjacent doors to allow both to open to 90º at the same time.

Door construction

Protection: Provide single right angle return on all sides and fit suitable resilient sealing rubber to provide the documented IP rating and prevent damage to paintwork.

Hinges: Provide corrosion-resistant pintle hinges or integrally constructed hinges to support doors. For removable doors, provide staggered pin lengths to achieve progressive engagement as doors are fitted. Provide 3 hinges for doors higher than 1000 mm. Provide restraining devices and opposed hinges for non lift-off doors.

Door hardware: Provide the following:

- Corrosion resistant lever-type handles, operating a latching system with latching bar and guides strong enough to withstand explosive force resulting from fault conditions within the assembly.
- Dual, edge mounted, corrosion resistant T handles with provision for key locking cylinder.
- Captive, corrosion resistant knurled thumb screws.

Locking: Incorporate cylinder locks in the latching system. Provide cylinder locks matched to the principal's requirements. Key alike, 2 keys per assembly.

Door mounted equipment: Protect or shroud door mounted equipment and terminals to prevent inadvertent contact with live terminals, wiring, or both.

Earthing: Maintain earth continuity to door mounted indicating or control equipment with multi-stranded, flexible earth wire, or braid of equal cross-sectional area, bonded to the door.

Covers

Maximum dimensions: 900 mm wide and 1.2 m^2 surface area.

Fixing: Fix to frames with at least 4 fixings. Provide corrosion-resistant acorn nuts if the cover exceeds 600 mm in width. Rest cover edges on the cubicle body or on mullions. Do not provide interlocked covers.

Handles: Provide corrosion resistant D type handles.

Escutcheons

General: For doors enclosing circuit breakers, provide escutcheon plates as barriers between operating mechanisms and live parts.

Escutcheon plates

General: Provide plates or removable covers with neat circuit breaker toggle cut-outs allowing interchangeability of 1, 2 and 3 pole circuit breakers. Provide corrosion-resistant lifting handles or knobs. Provide unused circuit breaker toggle cut-outs with blanking in-fill pole covers.

Maximum dimensions: 900 mm wide and 1.2 m^2 surface area.

3.3.4 Factory finishes

General

Standard: To AS 2700.

Extent: Apply protective coatings to internal and external metal surfaces of assembly cabinets including covers, except to stainless steel, galvanized, electroplated, or anodised surfaces and to ventilation mesh covers.

Finish coats: Thermoset powder coating to APAS-0155/1 or two-pack liquid coating of APAS-2971 primer and proprietary or epoxy acrylic full gloss spray finish to Factory finishes schedule.

Factory finishes schedule

Mounting structure (brackets)	To match enclosure
Enclosure	Indoor assemblies: Architect to confirm colour Outdoor assemblies: Architect to confirm colour Assembly interior: Architect to confirm colour
Escutcheons	Removable equipment panels: Off white Y35
Doors	To match enclosure
Plinths	Black

3.3.5 Busbars

General

General: Provide main circuit supply busbars within assemblies, extending from incoming supply terminals to the line side of protective equipment for outgoing functional units and for future functional units.

Standards: To AS 3768, AS 3865 and AS 4388.

Submissions: Submit design calculations of non-type tested or non-proprietary busbar assemblies.

Definitions

Incoming busbars: Busbars connecting incoming terminals to line side terminals of main switches.

Main circuit supply busbars: Busbars connecting incoming functional unit terminals, or incoming busbars where no main switches are included, to outgoing functional unit terminals or outgoing functional unit tee-offs.

Tee-off busbars: Busbars connecting main busbars to incoming terminals of outgoing functional units.

Busbar construction

Material: Hard-drawn high-conductivity electrolytic tough pitched copper alloy bars, designation 110.

Temperature rise limits - active and neutral conductors:

- Maximum rated current temperature rise limits: 65 ± 1.5ºC above a 40 ºC ambient by type test or calculation to AS 3768 or AS 4388.

Maximum short-circuit withstand current temperature rise limits: 160ºC by calculation to AS 3865.

Cross section: Rectangular with radiused edges.

Supports: Sufficient to withstand thermal and magnetic stresses due to maximum prospective fault currents.

Support material: Non-hygroscopic insulation capable of holding busbars at 105ºC.

Flexible busbars: Not permitted.

Phase sequence

General: For main busbars and connections to switching devices, set-out phase sequence for phases A, B and C, from left-to-right, top-to-bottom and front-to-back when viewed from the front of the assembly.

Colour coding

General: Provide 25 mm minimum width colour bands permanently applied to busbars at 500 mm maximum intervals with at least one colour band for each busbar section within each compartment.

Active busbars: Red, white and blue respectively for the A, B and C phase.

Neutral busbar: Black.

MEN link: Green-yellow and black.

Protective earth busbar: Green-yellow.

Restrictions: Do not provide adhesive type colour bands.

Busbar systems

Type: Multi-pole proprietary busbar assemblies or busbar systems, verified for short circuit capacity and temperature rise-limits by type tests.

Current carrying capacity

Active conductors: Take into account thermal stresses due to short circuit current, assuming magnetic material enclosures located indoors in well-ventilated rooms and 90ºC final temperature.

Neutral conductors: Size to match incoming neutral conductor current carrying capacity.

Protective earth conductors: Size for at least 50% of the rated short circuit withstand current for 100% of the time duration.

Tee-off busbars current rating

For individual outgoing functional units: Equal to maximum frame size rating of the functional unit.

For multiple functional units: Equal to the diversity factors of AS 3439.1, based on frame size rating.

MEN links

MEN links > 10 mm^2 in cross-section: Bolted removable busbar links stamped MEN LINK, located in the incoming compartment, between neutral and earth busbars.

Fault current limiters

General: Rate busbars connected to fault current limiters to 100% of the indicated fault current limiter circuit breaker frame size or fuse base rating.

Busbar links

General: For current transformers, provide removable busbar links ≤ 450 mm long.

Cable connection flags

General: Provide and support busbar flags for equipment with main terminals too small for cable lugs. Provide flags sized to suit cable lug termination, with current rating of at least the maximum equipment frame size.

Phase isolation: Provide phase isolation between flags where the minimum clearance distances phase-to-phase and phase-to-earth are below the component terminal spacing.

Jointing

Type: High tensile steel bolts, washers and nuts, with lock nuts or locking tabs. Do not use tapped holes and studs or the like for jointing current carrying sections.

Busbar insulation

Active and neutral busbars and joints: Select from the following:

- Polyethylene: At least 0.4 mm thick with dielectric strength of 2.5 kV r.m.s for 1 minute, applied by a fluidised bed process in which the material is phase coloured and directly cured onto the bars.
- Close fitting busbar insulation mouldings at least 1 mm thick.
- Heat shrink material: Only on rounded edge busbars.

Taped joints: Apply non-adhesive stop-off type tape, coloured to match adjacent insulation and half lapped to achieve a thickness at least that of the solid insulation.

Damaged insulation: Repair damaged insulation before energising.

3.3.6 Neutral links and earth bars

Terminals

General: Provide terminals for future circuits.

Links

Assembly capacity > 36 poles: Provide neutral links and earth bars at the top and bottom of the circuit breaker section.

Assembly capacity ≤ 36 poles: Provide links and bars at the point of entry of incoming supply cables.

Mounting: Mount neutral links on an insulated base.

Control circuits: Provide separate neutral links and earth bars.

Labels: Provide labels for neutral and earth terminals.

Cables > 10 mm^2: Provide bolts or studs.

3.3.7 Internal wiring

Wiring

General: Cable type: 0.6/1 kV copper cables. Provide V-90HT insulation where directly connected to active and neutral busbars.

Cable interconnections

General: For the main circuit supply, provide cable interconnections as follows:

- ≥ 1.5 mm^2 internal cables, with minimum V75 insulation rating with stranded copper conductors rated to AS/NZS 3008.1.1. Provide cables with current ratings suitable for the internal assembly ambient air temperature and for temperature rise limits of equipment within the assembly.
- Run cables clear of busbars and metal edges.
- Provide cables capable of withstanding maximum thermal and magnetic stresses associated with relevant fault level and duration.
- Run cables neatly. Provide slotted trunking sized for future cables or tie at 150 mm maximum intervals with ties strong enough to withstand magnetic stresses created at the specified fault current. Do not provide adhesive supports.
- Ensure wiring for future equipment can be installed without removal of existing equipment.
- Identify power and control cables at both ends with neat fitting ring type ferrules agreeing with record circuit diagrams. Mark to AS/NZS 4383.
- Terminate control cables and motor control circuits in tunnel terminals or, if necessary, provide suitable palm type lugs and correct crimp tool.
- For equipment mounted on hinged doors run cables on the hinge side to avoid restricting the door opening. Bundle cables with spiral wrap PVC.
- If recommended by device manufacturers, provide shielded wiring.

Adjacent circuit breakers: If suitable proprietary multi-pole busbar assemblies are available to link adjacent circuit breakers, do not provide cable interconnections.

Cables > 6 mm^2

Terminations:

- Tunnel terminals: Single cables.
- Other connection points or terminals: ≤ 2 cables.

Doors: Do not run cables to hinged doors or removable panels.

Supports:

- Spacing at enclosure: ≤ 200 mm from a termination.
- Spacing generally: ≤ 400 mm.

- Strength: Capable of withstanding forces exerted during fault conditions.

Single core cables rated ≥ 300 A: Do not provide ferrous type metal cable saddles.

Terminals marked: Terminate marked cables for connection to external controls in correspondingly marked terminals within the assembly.

Control and indication circuits

General: Provide conductors sized to suit the current carrying capacity of the particular circuit.

Minimum size: 1 mm^2 with 32/0.2 stranding.

Cable colours

General: Colour code wiring as follows:

- A phase: Red.
- B phase: White.
- C phase: Blue.
- Neutral: Black.
- Earthing: Green-yellow.

3.4 Switchboard Components

3.4.1 Switch-isolator and combination fuse-switch units

General

Standard: To AS 60947.1 and AS/NZS 3947.3.

Poles: 3.

Operation: Independent manual operation including positive ON/OFF indicator.

Shrouding: Effective over range of switch positions.

Rated breaking capacity: ≥ rated full load current.

3.4.2 Moulded case and miniature circuit breakers

General

Moulded case breakers: To AS 60947.1 and AS 60947.2.

Miniature circuit breakers: To AS/NZS 60898.1 or AS 3111.

Operation: Independent manual operation including positive ON/OFF indicator.

Isolation facility: Required.

Mounting: Mount circuit breakers so that the ON/OFF and current rating indications are clearly visible with covers or escutcheons in position. Align operating toggles of each circuit breaker in the same plane.

Utilisation category: Moulded case breakers:

- Final subcircuits category: Category A.
- Mains and submains: Category B.

Trip settings: Set as documented, seal, and label.

Trip units: Connect circuit breakers with interchangeable and integrally fused trip units so that trip units are not live when circuit breaker contacts are open.

3.4.3 Residual current operated circuit breakers

Standard: To AS/NZS 3190.

Integral non-overload protection type: To AS/NZS 61008.1.

Integral overload protection type: To AS/NZS 61009.1.

Modular type: To AS 60947.2.

Mounting: Comply with Moulded case and miniature circuit breakers, in *Circuit breakers*.

Maximum tripping current: 30 mA.

Nuisance tripping: Breakers shall be specifically suitable for operation in demanding environments where disturbances (e.g. from transients, leakage currents, switching operation of capacitors, DC component in currents, etc.) can cause nuisance tripping or blinding faults (non-tripping) of RCD.

Approved manufacture: Schneider Si range (for normal environments) and SiE range (for humid and/or environments polluted by aggressive agents such as salt spray and chlorinated compounds), or equal Terasaki/NHP.

3.4.4 Current transformers for Metering and Sub-metering

Standard

Measurement current transformers: To AS 60044.1.

Test links

General: Provide test links for connection of calibration instruments and meters and for shorting of current transformer secondaries.

Energy meters, maximum demand meters, ammeters and protection relays: Provide with rail-mounted links consisting of screw-clamped slide links and an earth link.

Test studs

General: For energy and demand meters provide rail-mounted potential test studs or plug connections next to associated current transformer links. Provide at least one set of test studs for each compartment.

Accuracy classification

Energy measurements: Class 1.

Indicating instruments: Class 3.

Ratings

Rated short time current: At least the short time withstand current equivalent of the circuit in which the transformer is installed.

Rated primary current: At least equal to the current rating of the functional unit.

Secondary windings: Rated at 5 A, burden of 0.4 Ω (10 VA) with star point earthed.

Overload: At least capable of withstanding 20% overload above the primary rating.

Type

General: If practicable, cast resin encapsulated window-type with busbar clamping devices. Otherwise wound-primary type with mounting feet.

Installation

General: Install transformers to permit easy removal.

Removable links: Provide removable links of minimum length for transformers fitted on busbar systems.

Connection details: To be clear and concise for both primary and secondary windings.

3.4.5 Instruments and meters

Standard

General purpose electronic induction watthour meters: To AS 62053.21.

Accuracy

Indicating instruments and accessories: ≤ Class 1.5.

Thermal maximum demand indicators: Class 3.

Electricity (sub-) meters: Class 1.

Power factor meters, phase angle meters and synchroscopes: 2 electrical degrees maximum error.

Transducers: Class 0.5.

Mounting

General: DIN or flush mount meters on hinged panels.

Labels

General: If associated exclusively with one phase, label meters *RED*, *WHITE*, or *BLUE* as applicable.

If associated with a downstream distribution board, label with the name of the distribution board.

Protection devices

Meter potential protection devices: Group together behind associated meter cover or hinged door, preferably next to current transformer test links.

Accessories

General: Mount next to associated instruments, inside cabinets.

Transducers

General: If necessary for transducer operation, provide auxiliary supply. Connect outputs to dedicated rail-mounted isolating type terminals.

Ammeters

Type: Moving iron type oil dampened for motor starter circuits.

Overscale: For ammeters subject to motor starting currents, overscale to at least 5 x full load current.

Selector switches: 4-position type with positions designated *R/W/B/OFF*. Mount under or beside relevant ammeters.

Voltmeters

Type: Moving iron.

Selector switches: 7-position voltage transfer type for measurement of phase-to-phase and phase-to-neutral voltages with off. Mount under or next to relevant voltmeters.

Wattmeters and varmeters

General: Suitable for balanced 3 phase, 4 wire loads. Connect to measurement transducers.

Hours-run meters

General: 6 figure (minimum), horizontal linear digits dial with last digit read-out in 0.1 hour increments.

Watthour meters

Type: Electronic type.

3-phase metering: Polyphase meters suitable for balanced 3 phase, 4 wire loads.

1 or 2 phase metering: Single phase meters.

Current rating: To suit load and overload conditions. Provide direct connect meters suitable for current range of 15 to 100 A and meters with current transformers suitable to 5 A secondary. Each meter shall be pre-configured by the manufacturer for the required CT ratio and be labelled to show this or incorporate dip switches to allow setting of the CT ratio.

Function: Measuring and recording kWh pulses via relay outputs for use by the BAS and ABGR energy monitoring system.

Pulses: Each pulse shall represent an energy value of 0.1 kWh and have a duration not less than 250 msec.

Display: Provide a direct reading LCD or LED display, 3 x 4, of the large figure type visible from the front of the display. Mark on the scale the metering transformer ratios and the multiplying factor applied to the meter constant.

Isolation: Provide isolation transformers to eliminate interference/inaccuracy with readings.

Covers: Seal main covers.

3.4.6 Control devices and switching elements

Standards

General: To AS 60947.1 and AS 60947.5.1.

Switching elements:

- Electrical emergency stop device with mechanical latching function: To AS 60947.5.4.
- Electromechanical control circuit devices: To AS 60947.5.1.
- Proximity switches: To AS 60947.5.2.

Rotary switches

General: Cam operated type with switch positions arranged with displacement of 60º.

Off position: Locate at the 12 o'clock position. Test positions must spring return to off position.

Rated operational current: At least 6 A at 230 V a.c.

Escutcheon plates: Provide rectangular plates securely fixed to the assembly panel. Identify switch position and function.

Control relays

Standards: To AS 60947.5.1.

Operation: Suitable for continuous operation. Provide relays selected in conformance with the Control relay selection table.

Construction: Plug-in types. Receptacle bases with captive clips which can be operated without using tools.

Contact elements: Electrically separate, double break with silver alloy, non-welding contacts.

Configuration: For standard relays, provide assemblies with ≥ 2 sets of contacts and expandable to 8 sets of contacts in the same assembly. Provide at least one normally-open and one normally-closed contact.

On site conversion: Provide contact blocks readily convertible to either normally-open or normally-closed contacts.

Control relay selection table

Relay type	Minimum mechanical life (million operations)	Base	Minimum contact rating	Inter-changeable	Minimum number of contact elements
1	5	Plug-in	$1.25I_L$	Yes	2
2	10	Plug-in	5 A at 240 V	Yes	2
3	10	Fixed mounting	5 A at 240 V	Yes	4

Time delay relays

Adjustable range: Adjustable over the full timing range with timing repeatability within ± 12.5% of nominal setting.

Electronic relays: Incorporate light emitting diodes indicating energisation states of relays.

Synchronous relays

General: Provide synchronous motor drive type relay fitted with anti-stalling device which protects gearing during normal operation.

Phase failure relays

General: Provide separate solid-state phase failure relays which release at the following:

- < 85% of normal voltage.
- Single phase failure.
- Reverse phase sequence after an appropriate time delay.

Sensing circuit: To reject induced voltage spikes and disturbances with frequencies other than 50 Hz.

Back-up protection: Provide high rupturing capacity fuses to each phase.

Push-buttons

Type: Oil-tight, minimum 22 mm diameter, or 22 x 22 mm.

Rated operational current: At least 4 A at 240 V a.c.

Emergency stop devices with mechanical latching: To AS/NZS 3947.5.5.

Marking: Identify functions of each push-button. For latched STOP or EMERGENCY STOP push-buttons, provide label with instructions for releasing latches.

3.4.7 Semiconductor controllers and contactors

General

General: Provide semiconductor controllers and contactors rated for the characteristics of the controlled load.

Standard: To AS/NZS 3947.4.3.

3.4.8 Indicator lights

Standard

General: To AS 60947.5.1.

Neon indicators

General: 240 V, 12 mm diameter with in-built resistor.

LED indicators

General: 12 or 24 V as necessary, in corrosion-resistant bezel, nominal 5 mm diameter.

Press-to-test

Compartments/subsections with < 5 indicating lights: Provide each indicating light with a fitted integral press-to-test lamp actuator.

Compartments/subsections with ≥ 5 indicating lights: Provide a common press-to-test lamp push-button.

3.4.9 Indicating counters

General

General: Provide the following:

- At least 6 digits.
- Digits at least 3.5 mm high.
- Continuous duty rated.
- Non-reset type.
- 500 V surge diverters.

3.4.10 Alarm annunciators

General

General: Provide the following:

- Labelled annunciator illuminated windows, to indicate status and alarm conditions.
- Lamp test acknowledge-mute and reset individual push-buttons.
- Audible alarm and associated logic circuitry.

Mode of operation

General: Provide the following functions:

- Fault conditions: To initiate flashing of appropriate annunciator lamps and sounding of audible alarms.
- Operation of acknowledge and mute buttons: To silence audible alarms and change annunciator lamps to the steady state on condition.
- Window: To extinguish only when fault condition has been cleared and alarm reset push-button has been activated.
- Subsequent alarms on other inputs: To reactivate the audible alarm and flash the appropriate annunciator lamp.
- Resetting: After correction of the fault condition, provide on-site choice of either automatic resetting or manual resetting at the annunciator panel.

Type

General: Extra-low voltage, solid state, flush mounted, window type.

Lamps

General: Provide annunciators with 2 extra-low voltage lamps per window.

Rated voltage of lamps105% of the annunciator system voltage.

Replacing: Changeable from front of panel without affecting condition of annunciator.

Vibration: Provide lamps which do not disconnect due to vibration.

Extra-low voltage power supply

General: Provide an extra-low voltage power supply for the alarm annunciator.

Windows

Nominal size: 15 x 35 mm.

Engraving: Filled in black.

- Background colours: White for status monitoring, red for alarms and shutdown functions.

3.4.11 Audible alarm devices

Sound level

General: The greater of the following:

- 65 dB(A) at 1 m.
- 15 dB(A) above ambient sound levels at any location in designated areas.

3.4.12 Extra-low voltage transformers

General

General: Provide the following:

- Centre tap on secondary winding.
- Primary and secondary windings wired out on opposite sides of transformer case.
- Primary and secondary windings separated by means of an earthed screen wired out to an insulated terminal.
- Transformer rating ≥ 125% of maximum output load, taking account of degree of ventilation and ambient temperature within assembly, and supplied load.

3.4.13 Spares cabinet

General

General: Provide a spares cabinet with main name plate, labelled shelves and non-lockable door. Size for storing racking handles, special tools, spare lamps, spare fuse links and other equipment necessary for satisfactory assembly operation.

Location: Either of the following:

- Incorporated into assembly enclosure.
- Wall mounted in main switchroom.

Finish: To match assembly.

3.5 Execution

3.5.1 Marking and labelling

General

General: Provide labels including control and circuit equipment ratings, functional units, notices for operational and maintenance personnel, incoming and outgoing circuit rating, sizes and origin of supply and kW ratings of motor starters.

Labels on assembly exteriors

Manufacturer's name: Required.

Assemblies: Label with essential markings.

Designation labels: For other than main assemblies, provide designation label stating source of electrical supply. Identify separate sections of enclosures.

Assembly controls: Label controls and fault current limiters, including the following:

- Circuit designation for main switches, main controls and submains controls.
- Details of consumers mains and submains.
- Incoming busbar or cable rating to first tee-off.
- Fuse link size.

Labels on assembly interiors

General: Provide labels for equipment within assemblies. Locate so that it is clear which equipment is referred to, and so that lettering is not obscured by equipment or wiring.

Moulded case circuit breakers: If circuit breaker manufacturer's markings are obscured by operating handle mechanisms or motor operators, provide additional markings open to view on, or next to, the circuit breaker.

Arrestors: Label each group of primary arrestors, stating their purpose and the necessary characteristics.

Danger, warning and caution notices

Busbars: If polymer membrane coating is used without further insulation, provide warning notices on the front cover near the main switch or local main switch and on rear covers, indicating that busbars are not insulated.

Fault current limiters: In assembly sections containing fault current limiter fuses provide caution notices fixed next to the fault current limiters, stating that replacement fuse links are to match the installed fuse link ratings, make and characteristics. Provide separate label stating make and fault current limiting fuse ratings.

Externally controlled equipment: To prevent accidental contact with live parts, provide warning notices for equipment on assemblies not isolated by main switch or local main switch.

Stand-by power: Provide warning notices stating that assemblies may be energised from the stand-by supply at any time.

Insulation and shrouding: For insulation or shrouding requiring removal during normal assembly maintenance, provide danger notices with appropriate wording for replacement of insulation shrouding before re-energising assemblies.

Positioning: Locate notices so that they can be readily seen, next to or, if impracticable, on busbar chamber covers of functional units and behind the front cover of functional units. Provide circuit identification labels in the cabling chamber of each functional unit, located next to external terminations.

Schedule cards

General: For general light and power distribution boards, provide schedule cards of minimum size 200 x 150 mm, with typewritten text showing the following as-installed information:

- Submain designation, rating and short-circuit protective device.
- Light and power circuit numbers and current ratings, cable sizes and type and areas supplied.

Mounting: Mount schedule cards in a holder fixed to the inside of the assembly or cupboard door, next to the distribution circuit switches. Protect with hard plastic transparent covers.

Single-line diagrams

Custom-built assemblies: Provide single-line diagrams.

Format: Non-fading print, at least A3 size showing the situation as installed.

Mounting: Enclose in a non-reflective PVC frame and wall mount close to assembly.

Marking cables

General: Identify the origin of all wiring by means of legible indelible marking.

Identification labels: Provide durable labels fitted to each core and sheath, permanently marked with numbers, letters or both to suit the connection diagrams.

Multicore cables and trefoil groups: Identify multicore cables and trefoil groups at each end with durable non-ferrous tags clipped around each cable or trefoil group.

3.6 Completion

3.6.1 Completion Tests

General

Carry out the following tests:

- Electrical operation.
- Dielectric.

3.7 Installations

3.7.1 General

Fixing

General: Before making inter-panel connections, fix assemblies and metering equipment enclosures into position, level and plumb.

Cable entries

General: Neatly adapt one or more cable entry plates, if fitted, to accept incoming cable enclosure. Provide the minimum number of entry plates to leave spare capacity for future cable entries. Do not run cables into the top of weatherproof assemblies.

Single core cables rated > 300 A: Pass separately through non-ferrous gland plates. Do not provide metal saddles.

Cable enclosures

Cable enclosures: Continue cable enclosures to or into assemblies and fit cable entry plates so that the IP rating of the assembly and the fire rating of the cable are maintained.

Cable supports

Cable supports: Support or tie mains and submains cables within 200 mm of terminations. Provide cable supports suitable for stresses resulting from short circuit conditions.

3.8 Training of Operation and Maintenance Staff

General

- Provide training schedule and agenda and list of instructors from original equipment manufacturer (OEM) and the trader contractor.
- Provide classroom training
- Provide field training with demonstration on operation and maintenance.
- Review O&M documentation and test results.
- Review spare part list.
- Handing-Over and Employer's Acceptance
- Endorse defects list.
- Provide all keys
- Initiate certificate of readiness for handing-over.

3.9 Selections

3.9.1 Proprietary switchboards

Construction requirements schedule

Assembly designation	
Location	Refer drawings
Colour	Manufacturer's standard unless exposed to view where colour shall be to contract administrator's selection
Bus bar rated current (minimum)	160A
Rated short-circuit current (minimum)	20kA for 0.2 seconds
Form of separation (minimum)	Form 1
Limiting overall dimensions (width, height, depth)	To fit the spaces allocated – manufacture switchboards to suit
Main isolator rated current (minimum)	160A
Future circuits required	≥ 20% spare poles
Surge diversion required	No

4. Lighting

4.1 General

4.1.1 Aims

Responsibilities

General: Provide lighting as documented.

4.1.2 Project requirements

Proprietary equipment

General: The requirements of this specification for lamps, ballasts and luminaire control equipment over-ride the specifications inherent in the selection of a particular make and model of luminaire.

Minimum energy performance standards (MEPS)

General: To AS/NZS 4783.2 and AS/NZS 4782.2 and the following.

EEI classification: Minimum Energy Efficiency Index performance classification for lamps and ballasts shall be A1 for dimmable electronic, A3 for electronic and B1 for ferromagnetic.

4.1.3 Cross references

General

General: Conform to the *General requirements (electrical)* worksection.

Associated worksections

Associated worksections: Conform to the following:

- *Low voltage power systems*.
- *Wiring and Accessories*

4.1.4 Standards

Standards

EMC compliance: To AS/NZS CISPR 15.

Energy efficiency for ballasts and lamps: To AS/NZS 4783.2.

Fixed general purpose luminaires: To AS/NZS 60598.2.1.

Floodlights: To AS/NZS 60598.2.5.

Harmonic limits: AS/NZS 61000.3.2.

Luminaires, general requirements and tests: To AS/NZS 60598.1.

Luminaires: To AS/NZS 60598.1.

Luminaires with built-in transformers for filament lamps: To AS/NZS 60598.2.6.

Portable general purpose luminaires: To AS/NZS 60598.2.4.

Recessed luminaires: To AS/NZS 60598.2.2.

Road lighting luminaires: To AS/NZS 1158.6.

Radio interference limits: To AS/NZS CISPR 15.

4.1.5 Interpretations

Abbreviations

General: For the purposes of this worksection the abbreviations given below apply.

- CCT: Correlated colour temperature.
- CRI: Colour rendering index.
- DALI: Digital addressable lighting interface.
- EEI: Energy efficiency index.
- ELV: Extra low voltage.
- ILCOS: International lamp coding system.
- LED: Light Emitting Diode
- PLC: Programmable logic controllers.
- RGB: Red Green Blue (Colour Changing)
- SBC: Small bayonet cap.
- SES: Small Edison screw.

Definitions

General: For the purposes of this worksection the definitions given below apply.

- Control system: A lighting control system comprising a combination of some or all of the following:
    - Automatic sensing and control components.
    - Timers.
    - Manual overrides.
    - Programming using a computer interface.
- Proprietary luminaires: Luminaires available as a catalogue item.
- Custom-built luminaires: Luminaires manufactured to order.

4.1.6 Submissions

Technical data

General: Submit technical data of the following:

- Luminaires
- Lamps

- Ballasts
- Power factor correction equipment
- Lighting control systems.
- All accessories.

Submit photometric data for each type of custom-built luminaire in hard copy and in IES standard electronic format.

Standard: To AS 1680.3.

Samples

Prototypes: Submit completed prototypes of each type of custom-built luminaire before production runs commence.

General: Submit samples of all luminaires and accessories.

Shop drawings

General: Submit shop drawings of lighting column mounting bases.

4.2 Products

4.2.1 Luminaires

General

General: Provide luminaires complete with lamps, luminaire control equipment, lighting control equipment, and accessories as documented.

4.2.2 Construction

Stiffness

General: Provide materials, body shape and methods of manufacture so that luminaires neither warp nor sag when installed.

Ceiling trim

Provision for recessed mounting in suspended ceilings: To AS 2946.

Moulded plastic bodies

Exterior use: UV stabilised.

Depth

Fluorescent T8 /T25 lamps ULB/LB luminaires: 100mm maximum.

Hinged diffusers

General: Provide hinged diffusers securely connected to the luminaire body, with the diffuser held captive.

Reflectors and diffusers

Reflectors: Multi-cell parabolic. Iridescence to be avoided by processes to approval. Aluminium purity 99.85%.

Diffusers: K19 prismatic. UV stabilised polycarbonate in vandal-prone areas where indicated.

During construction the following items shall be considered:

- No light leaks within luminaires and junction of ceiling to lamps
- All luminaire components and trims to be securely fixed to avoid dislodgement or displacement
- Luminaires to be capable of being securely fixed to all mounting points
- Luminaire dimensions to be uniform and square in appearances
- No components to deform whilst in usage
- Enable lamp replacement to occur without total dismantling of the fitting
- All luminaires to be fixed by multiple (min 2) fixing points
- Provide a valid certificate of approval for all luminaires

4.2.3 Lamps

Standards

Fluorescent: To AS 4782.1 and AS 4782.2.

Self ballasted lamps: To AS/NZS 60968 and AS/NZS 60969.

Single capped fluorescent lamps: To AS/NZS 60901.

Fluorescent lamps

Lamps: 16mm diameter (T5) 49W CCT 4000K (unless otherwise directed), high efficiency, triphosphor, low mercury ‘Philips’ TL5/840A or equal Sylvania, Osram.

Colour rendering: Group 1B to AS/NZS 1680.1.

Incandescent lamps

Shall not in general be used.

Tungsten halogen lamps

Tungsten halogen lamps not enclosed behind glass: low pressure, low UV emission type.

Low voltage dichroic lamps: Provide dichroic lamps with integral reflectors and clear glass lens.

- Luminaires to be designed to withstand heat concentrations
- Provide 50mm clear space around all luminaires for in-ceiling mounting
- Provide open and clean ventilation chambers in luminaire recesses

- Luminaires to be aligned vertically unless otherwise noted
- Provide Regulative labelling at switchboard for ELV lighting (refer AS3000)

Install Electronic transformers for ELV lights and maximum light fitting wattage

4.2.4 Other controlgear

Standard

General: To AS/NZS 61347 Parts 1 and 2.

ELV transformers

General: For extra-low voltage tungsten halogen lamps provide the following:

- One dimmable electronic transformer per lamp with power rating matching the lamp, or.
- Common dimmable electronic transformers with power rating matching the lamps.

Performance: Transformers shall maintain constant secondary voltage irrespective of load and maintain primary/supply mains fluctuation within normal limits.

Transformer regulation: 5%.

Dimming capability: Suitable for the digital control system.

Type: Atco Tridonic or Osram.

Regulation

Output voltage: Not in excess of the nominal rated lamp voltage at a load of 75% of nominal transformer rating.

4.2.5 Ballasts

General

General: Provide ballasts for lighting systems selected to be compatible with the lamp and control method.

Standard: To AS/NZS 61558.1.

Electronic fluorescent lamp ballasts

Standards: To AS/NZS 61347.2.3 and AS/NZS 60929.

Current total harmonic distortion: < 15%.

Number of ballasts: Provide 1 ballast for both lamps in twin luminaires generally, except where separate control is required (for example, separate up and down lamps). Multi-lamp ballasts are permitted in luminaires where applicable.

Starting: Warm start within 1.5s and additionally to meet the starting requirements over the dimming range.

Lamp failure mode: Automatic switch-off when lamps are defective. Auto-restart of replaced lamps.

Dimming ballast type: Digital addressable ballasts giving disturbance-free, precise control. Compliant with DALI ballast standard in accordance with IEC 60929. Analogue ballasts not permitted.

Approved manufacturer: Atco Tridonic or Osram.

Reactive fluorescent lamp ballasts

Standard: To AS/NZS 60921 and AS/NZS 61347.2.8.

Connections: Provide quick-connect terminals or wiring, suitable for the operating temperature close to the ballast.

Number of ballasts: Provide separate ballasts for each lamp.

Type: Atco LLEC equivalent.

Ballast performance measurement – fluorescent lamps

Standard: To AS/NZS 4783.1.

4.2.6 Power factor correction

General

General: Provide power factor correction on all luminaires to a minimum power factor of 0.9 lagging for ferromagnetically ballasted luminaires and 0.95 for electronically ballasted luminaires.

Capacitors

Standard: To AS 61048 and AS 61049.

Integral fuses

General: Provide integral fuses for high intensity discharge (HID) lamp ballasts.

4.2.7 Accessories

Lighting outlets

Pin arrangement: Standard: 3 flat pin with looping terminal.

Lighting switches

General: Provide lighting switches as documented.

Standard: To AS/NZS 3133.

Style, material, colour: As nominated in *General requirements (electrical)*. Where 6 or more switches are ganged together use stainless steel switchplates with no visible fixings.

Minimum: 16 A, 230 V a.c.

Dimmer switches

General: Provide integral dimmer/switch units as documented. Refer also *Lighting control system.*

Proximity switches

General: Provide proximity switches as documented.

Standard: To AS/NZS 60947.5.2.

Daylight switches

General: Provide integral photo electric switch units as documented, interfaced to the digital control system.

Performance: Adjustable between 50 and 1000 lux. Daylight switches shall incorporate a microprocessor which will retain the programmed parameters in the event of power failure.

Time delay: > 2 minutes.

Illumination differential: > 50 lux. Daylight switches shall allow connected luminaires to be switched off after they have dimmed to minimum output, or to hold light output at a minimum illuminance level regardless of ambient levels.

Integration: May be integral with motion detector switches.

Compatibility: Dynalite.

Motion detector switches

General: Provide movement detectors which cover designated areas as documented, interfaced to the digital control system.

Timer: Incorporate ‘on’ timer adjustable between 1 and 5 minutes minimum and 2 hours minutes maximum.

Standard: To AS 2201.3 and BCA Section J Specification J6.

Type: Passive infra-red or ultrasonic microwave. May be integral with daylight switches.

Quantity: Provide sufficient quantity for full coverage of the designated zone or area. Mount detectors to avoid detection of movement outside the designated areas. Detector beam patterns and types shall suit the designated zone or area and include sensing range adjustments.

Compatibility: Dynalite.

Manual time delay switches

General: Proved manual time delay relay switches as documented.

Type: Electronic.

Duration: Adjustable between 5 minutes and 15 minutes.

Indicator light: Required. Activated when artificial illumination is ‘off’.

4.3 Lighting Control System

4.3.1 General

Aims

The purpose of this document is to specify a lighting control system complete with all dimmers, switches and other control devices, control panels, power supplies, wiring and other equipment necessary to provide a complete and operational installation. The system shall be Dynalite which provides free

topology incorporating distributed intelligence with unshielded twisted pair (UTP) network cabling between each device

The system shall be installed by a contractor who shall be certified by Dynalite and who shall be responsible for the overall system implementation and project management. The contractor shall provide shop drawings, functional/addressing details, device programming, on site commissioning/ verification, as-built documentation and defects liability maintenance. Where high level integration is required, the contractor will consult with the relevant third party companies prior to commencement of installation, to review the methodology and confirm responsibility of each party to ensure a functional solution is offered that meets client requirements.

Documentation

Detailed lighting control system design documentation, shop drawings and test plan shall be produced by the contractor before commencement of installation.

At project completion lighting control system shop drawings shall be provided to the client as hard (printed) copies and software files (in PDF and either DWG or DXF format). These shall be updated to an “as installed” state prior to acceptance and signoff.

Standards and Compliance

The works shall comply with the requirements of current relevant standards. These include:

- Building Code of Australia
- Australian Standards
- Fire Services Regulations (for the relevant state or territory)
- Electricity provider's regulations and conditions of supply
- Australian Communications Authority Regulations
- Occupational Health and Safety Regulations.

Installation

Installation shall be performed by subcontractors who hold a license appropriate for any work they perform.

Programming

Dynalite programming shall be performed by Dynalite accredited personnel. Programming shall be carried out in accordance with this Electrical Specification.

Balanced Load

Where multiple mains power phases are available the electrical load shall be distributed across all phases as evenly as practicable.

Site Testing

A test plan shall be produced by the Dynalite system designer prior to commencement of installation. Once the installation and programming of the lighting control system is complete, site testing shall be performed in accordance with the test plan. As each test is performed with a passing result this shall be

recorded on the test plan. As a minimum, the following tests shall be included in the test plan and performed prior to sign-off:

System Functionality Test

Verify that all inputs and outputs function correctly. Check each area's functionality against the area control strategies described in Section 3.0 and above. Where different strategies apply at difference times (such as normal and after hours), ensure that each is tested.

Operation and Maintenance Manual

Prior to project sign-off the contractor shall compile an operation and maintenance manual and deliver it to the project manager. The Operation and Maintenance Manual shall include the following information:

- system architecture diagram
- switchboard layout drawings
- tags and programmed functions
- channel connection identification
- floor plans showing devices, load and cable run locations
- recommended scheduled maintenance procedures
- technical literature for each type of device used in the project
- Control system configuration files on CD-ROM.

All drawings and diagrams shall be provided as hard (printed) copies and software files (in PDF and either DWG or DXF format). Drawings shall be updated to an "as installed" state for placement in the Operation and Maintenance Manual.

Training

The installing contractor shall allow for on site training for the client or their nominated representative after practical completion, at a time and date to be nominated by the facility manager or client's representative.

Provide on site training for a duration of 2 hours.

Acceptance and Signoff

Acceptance shall take place once installation, programming, commissioning and maintenance obligations have been fulfilled. At this point sign-off shall occur by presenting a client acceptance form to be signed. The client acceptance form shall outline test procedures and results, as-built documentation including wiring diagrams, control equipment layout, device configuration schedules, functionality statements and other supporting documentation deemed necessary to provide the client with an acceptable level of project information.

Review and Maintenance

The project shall be reviewed at three months after the date of practical completion as submitted by the contracting party, to ensure that appropriate system configuration is maintained. Maintenance shall not extend to system configuration changes deemed desirable by the client which are outside the review and maintenance agreement.

Allow for 1 day on site works for modifications as deemed desirable by the Client to the system, three months after the date of practical completion.

4.3.2 System Strategy

Design or System Modifications

Any modifications to the topology, system components or functionality shall be submitted to the electrical consultant or client representative for approval.

Bus Protocol

The lighting control system shall use distributed intelligence where individual units update their status and provide transmission error checking.

The protocol shall use full duplex communication and utilise checksum algorithms to ensure incorrect data is ignored. The protocol shall be available to third party companies to develop interfaces to the installed system.

The system shall be capable of providing constant feedback on the operational status of inputs and outputs and be capable of interrogating the status of specific devices. Units shall use non-volatile memory to retain programmed parameters when not powered.

Network Topology

The network topology of the lighting control system shall be flexible and allow devices to be connected in a star, daisy chain (in series) or combination of star and daisy chain configuration. An individual network shall support up to 255 unit addresses and many thousands of group address/application address combinations. The topology shall allow up to 255 networks to be connected utilising a Dynet, USB or Ethernet backbone, or combination of backbone types.

Cabling

Cabling between lighting control system components shall be yellow Cat-5 unshielded twisted pair (UTP) with a mains rated outer sheath. The cable colour shall be yellow so as to differentiate from cables used for other purposes.

Lighting control system cabling shall be segregated from mains cabling in accordance with AS3000 and the system's manufacturer requirements.

Cable shall be continuous, joined only by RJ45 connectors/sockets/surface mount blocks or terminated in screw block terminals using bootlace ferrules (crimps).

RJ45 plugs shall be used to connect cable to system components which provide RJ45 connection sockets. The RJ45 plugs must be suitable for the cable they are attached to in terms of wire type (solid or stranded).

When landscape (horizontally) mounted DIN Rail enclosures are used, lighting control system cabling shall be neatly arranged and fed to the left side of the DIN enclosure; mains wires shall be neatly arranged and fed to right side. Segregation must be maintained in accordance with relevant standards.

Programmability

Individual components of the lighting control system shall be configurable across the network using PC software with a Windows® operating system. Each unit which communicates on the network shall be given a unit address unique to the specific network, and have a serial number which may be retrieved by the configuration software.

High Level Integration Options

The lighting control system shall be capable of integrating with third party systems including DALI, DSI, HVAC, audiovisual and building management systems via various mediums and protocols including Ethernet, RS-232, NEC IR, OPC, BACnet.

The lighting control system shall be capable of being controlled via a hand held remote control, and by a networked PC.

The manufacturer shall liaise with the relevant third party companies and submit for approval shop drawings and demonstration systems to confirm compatibility and functional requirements.

Emergency Override

Lights controlled by the lighting control system shall be capable of being simultaneously switched on manually or automatically in the event of a lighting control system communications failure whenever mains power is available. This shall be switchable through the lighting control system network cable irrespective of whether the network is powered and functional.

4.4 Execution

4.4.1 Supports

General

General: Install luminaires on proprietary supports by means of battens, trims, noggings, roses and packing material.

Suspended luminaires

Rods: Steel pipe suspension rods fitted with gimbal joints.

Chains: Electroplated welded link chain.

Levelling wire: Stainless steel.

Levelling: Adjust the suspension system length so that the lighting system is level and even.

Horizontal tolerance: $\pm$ 3 mm between luminaires within the one space.

4.5 Wiring

Flexible cords

General: Provide recessed luminaires with an external $\geq$ 1.5 m length of 0.75 mm^2 3-core V75 (minimum) PVC/PVC flexible cord, connected to a 10 A 3-pin moulded plug to AS/NZS 3112.

DALI dimmable luminaires: Provide, in addition, an external ≥ 1.5m length of 0.75mm^2 2-core V75 (minimum) PVC/PVC flexible cord, connected to a suitable moulded plug (alternatives to be considered include integration with 3-core flexible cord).

Other fittings flexible cord cross sectional area: ≥ 1 mm^2. Where exposed, colour as directed by the contract administrator.

Terminal blocks

General: Provide terminals with 2 screws each and capable of accommodating ≥ three 2.5 mm^2 conductors.

Minimum cable size

Screwed connectors: 24/0.2 mm.

Quick connectors: 1/0.75 mm.

Fluorescent luminaires

Cable: V-90HT copper cable conductor.

Loom wiring: Neatly loom the wiring and install it clear of ballasts. Fix looms to the luminaire body with clips made from soft metal or polyethylene.

4.5.1 Wiring connection

Suspended luminaires

Accessible ceilings: Connect suspended luminaires to a plug socket outlet within the ceiling void. Provide a neat, flat plate for the plug access at the ceiling plane; plate colour to match ceiling colour.

4.6 Completion

General

General: Verify the operation of all luminaires.

Digital controls/lighting control system: The commissioning of the lighting control system, including DALI ballasts, must be undertaken by the lighting control system supplier and must be performed on site.

Re-lamping: Replace lamps and starters which have been in service for a period greater than 25% of the lamp life as published by the lamp manufacturer.

Dust and finger-marks: Remove all dust and finger-marks from louvres and luminaires

Spare luminaires and outlets schedule

Provide the following additional luminaires and lighting outlets at locations not shown on drawings or scheduled elsewhere, as directed during the works. Include circuit breakers, cabling, accessories, installation, etc. as required.

Spare item	Quantity to be allowed
Interior 3-pin lighting outlet connected to a lighting outlet on the same circuit, 15m cable route length	5
Interior 4-pin lighting outlet connected to a lighting outlet on the same circuit, 15m cable route length	5
Exterior luminaire and lighting outlet connected to a lighting outlet on the same circuit, 15m cable route length	5
Exterior luminaire and mounting equipment connected to a lighting outlet on the same circuit, 30m cable route length	2

4.7 Maintenance

4.7.1 Working Procedures

Personnel: Experienced persons to be responsible for safe working procedures during the maintenance period.

Notification: Ensure that the occupants are advised of proposed maintenance periods. Allow to re-schedule maintenance periods if emergency use of the audio visual systems is required.

4.7.2 Operational Maintenance

Maintenance Period: Co-extensive with the Defects Liability Period.

Required: During the maintenance period:

- Carry out periodic inspections and perform maintenance work at the frequencies and following the procedures recommended by the manufacturers of the supplied equipment (except for maintenance work specified to be performed by the Principal);
- Promptly rectify faults. Replace failed materials and equipment, including batteries, lamps and fuses.

Minimum number of Visits: Once every three months for the complete defects liability period including extensions.

Certification: At the end of the maintenance period make a final service visit and, upon satisfactory completion of the above procedures, certify in writing that the installation is operating correctly. At the final service visit, make adjustments to the audio visual systems as instructed by the occupants.

4.7.3 Manuals

Requirement: Before commencement of operational maintenance, provide the specified number of copies of a combined operator's manual and technical manual, written in clear concise English, containing a title page listing suppliers' names, addresses and telephone numbers, a table of contents, and the following data:

Operator's Manual

- Correct procedures for switch on and shut down of each audio visual system.
- Correct procedures for operating each audio visual system.
- Maintenance procedures: Recommended maintenance periods and procedures.
- Tools: Particulars of maintenance equipment and tools provided with instructions for their use.

Technical Manual

- A copy of the Work-As-Executed drawings including schematic diagrams, layout drawings and joinery shop drawings.
- A technical description of the equipment supplied with diagrams and illustrations.
- Procedure for dis-assembly and assembly of components.
- A list of spare parts provided.
- A complete set of customer data.
- Procedures for set-up and configuration.
- Hard copy of all software and programming.
- Hard copy of all set ups

Form: A4 size, printed or typed on durable printing paper, with each page consecutively numbered, and neatly bound in durable vinyl or similar hard covers.

Number of copies: Three (3)

Prototype copy: Provide a prototype copy before the start of the commissioning phase for approval by the Project Manager.

4.7.4 Training

Requirement: Provide a training course for up to six (6) staff personnel over a period of one day in the set-up, use and operation of the complete audio visual system. The course shall be carried out on site using the equipment installed under this contract and additional equipment as necessary for comprehensive simultaneous instruction.

Notice: Give sufficient notice that training for the audio visual systems is to commence to allow the Project Manager to coordinate attendance.

Minimum notice required: 10 working days.

Operator Training: Provide basic training in the set-up and use of all Audio Visual System components.

Maintenance Training: Provide basic training in the adjustment, programming, reconfiguration and basic maintenance of the system. Include instruction on:

- Component installation and removal
- Control system programming including setup for additional AV equipment
- Basic fault finding including connectors, fuses and lamps
- Periodic routine maintenance

5. Emergency Evacuation Lighting

5.1 General

5.1.1 Aims

Responsibilities

General: Provide stand alone weatherproof non-maintained emergency lighting and maintained exit signs with 24 metre and 32 metre viewing distance of pictograph element as documented on layout drawings.

5.1.2 Cross references

General

General: Conform to the *General requirements* worksection.

Associated worksections

Associated worksections: Conform to the following:

- *Electrical general requirements.*
- *Low voltage power systems.*
- *Luminaires – custom-built.*

5.1.3 Standards

General

System design, installation and operation: AS 2293.1.

Inspection and maintenance: To AS/NZS 2293.2.

5.1.4 Submissions

Samples

General: Submit samples of all luminaires, exit signs and suspension materials.

Technical data

General: Submit technical data for each type of luminaire and exit sign including the following:

- Maximum luminaire spacing for a given mounting height.
- Luminaire classification to AS 2293.3.

Type test data

General: Submit type test data.

Shop drawings

General: Submit the following:

- Construction details, overall dimensions and wiring arrangement for each custom built luminaire and exit sign.

5.2 Products

5.2.1 Emergency and Exit luminaires

General

Visual indicator lights: Provide a red indicator, readily visible when the luminaire is in its operating location, which indicates that the battery is being charged.

Inverter system: Provide protection of the inverter system against damage in the event of failure, removal or replacement of the lamp, while in normal operation.

Local test switches: Provide a momentary action test switch, accessible from below the ceiling, on each luminaire to temporarily disconnect the mains supply and connect the battery to the lamp.

Common test switches: Provide a common test switch on the local distribution board which disconnects main supply to the luminaires and tests for discharge performance. After testing, this switch must automatically revert to normal operating mode.

Batteries

Type: Lead-acid or nickel-cadmium batteries capable of operating each lamp at its rated output continuously at least 2 hours during completion tests and 1.5 hours during subsequent tests.

Battery life: At least 3 years when operating under normal conditions at an ambient temperature of 25°C and subjected to charging and discharging at 6 monthly intervals.

5 or 6 years is possible in some circumstances. See AS/NZS 2293.2 for system checks.

Marking: Indelibly mark each battery with its date of manufacture.

5.3 Execution

5.3.1 Emergency and Exit Luminaires

Power supply

General: Provide an unswitched active supply to each luminaire and exit sign, originating from the test switch control panel.

Data monitoring

General: Provide a connection from each emergency and exit luminaire and connect to the monitoring computer.

Test switch

General: Provide a timed test switch at each distribution board.

Function: To energise emergency lights and exit signs and then to automatically reset controls after a maximum of 2 hours.

5.3.2 Marking and labelling

Labelling

General: Label each luminaire with a unique identifying number and record the number and luminaire location in a schedule included in the emergency evacuation lighting operation and maintenance manual. The label must be permanently fixed, indelible and readable at a distance of 1 m.

5.3.3 Tests

General

General: Carry out tests, including out-of-hours tests, to demonstrate the emergency and evacuation system's performance. Include the following:

- Test components for correct function and operation.
- Demonstrate illumination performance on site, to at least the level stated in the manufacturer's performance specification for that device.
- Test operation of battery discharge test and control test switch functions, including discharge and restoration.
- Demonstrate system functions under mains fail condition.
- Demonstrate operation of the battery and charger including a full discharge/recharge over the designated time.Mains supply

General: Before commissioning, ensure mains supply has been continuously connected for at least 24 hours.

5.3.4 Maintenance

General

Emergency evacuation lighting: To AS 2293.2.

Interval: Carry out the 6-monthly procedures before practical completion and again before the end of the maintenance period.

6. Photovoltaic

6.1 General

6.1.1 Aims

Provide photovoltaic (PV) rooftop grid-connected generating systems as documented to the roof of the following buildings:

- South Melbourne Market Carpark Roofover with a minimum nominal rated capacity of 37 kilowatt peak

Site locations are given in Drawing 31-26867-E006.

6.2 Scope of Work

The works in this contract shall comprise the provision of all materials, labour, transport, tools, plant, applications, payment of fees and everything else necessary for the design, supply, installation, commission and maintenance of PV grid-connect rooftop systems with a total 37 kilowatt peak minimum nominal rated capacity as documented and shall include:

- Photovoltaic (PV) modules – Monocrystalline 245 watt nominal rated peak capacity
- Grid-connected inverters – 17kW with grid monitoring, power balancing, ground fault protection and grid protection capability
- Mounting frame and structural steelwork for installation of PV modules
- Balance of system components including DC and AC cabling and switchboards, data cabling, junction boxes, switchboards, conduit, cable tray, mounting brackets, etc.
- Stainless steel cabinet to house solar inverter.
- Grid connection and metering requirements of Citipower
- Data-logger(s) for monitoring PV system performance
- A display panel for displaying PV system performance (location to be nominated by South Melbourne Market)
- Lightning surge protection
- Testing and commissioning
- Inspections and witness testing of the PV system by the Engineer and/or Citipower
- Training of local staff in the basic operation, maintenance, and trouble-shooting of the PV systems
- Operation and Maintenance manuals
- Operating warranty
- All permanent and temporary safety and access equipment necessary for lifting materials and working at heights
- Warning labels in accordance with AS 3100 on all switchboards which have the PV installation upstream/downstream as per AS 4777

- Application and documentation required to satisfy Citipower requirements for connection of the PV system to its network
- Construction Certificate and Occupational Certificate.
- Sundry minor works as specified herein

All supports, brackets, drilling, penetrations, fire stops, water proofing and other building works associated with the above.

The tenderer shall advise any ambiguities in the document at the time of tender for the works specified. Claims for extra costs based on lack of knowledge of the documents will not be accepted after submission of the tender.

Provide all apparatus, appliances, materials, labour and services not specifically mentioned, that are necessary to form a complete fully operational system in all respects and without any additional cost. Price variation or extensions of time will not be allowed on the basis of lack of knowledge or familiarisation with other documentation for the project.

In carrying out the design and installation of grid-connected solar PV systems, the contractor will be required to undertake the work in accordance with the following most recent Australian Standards:

- AS 3100 Approval and Test Specification – General Requirements for Electrical Equipment
- AS 5033 Installation of Photovoltaic Arrays
- AS 3000 Electrical Wiring Rules
- AS 1768 Lightning Protection
- AS 1170.2 Wind Loads
- AS 4777 Grid Connections of Energy Systems via Inverters
- AS 2053 Conduits and Fittings for Electrical Installations
- AS 4509 Stand-Alone Power Systems
- AS 1664 Aluminium Structures
- Building Code of Australia
- Electricity Safety Act 2005c) and associated Safety Regulations
- Electricity Distribution Code (Vic)
- Victorian Service & Installation Rules
- Citipower requirements specifically deal with embedded generation.
- Other appropriate Australian Standards Contractor Requirements

6.3 Accreditation

The contractor must be accredited by the Clean Energy Council of Australia (CEC), formerly the Australian Business Council for Sustainable Energy (BCSE) in order to carry out PV design and installation works. For further information please see the Clean Energy Council of Australia Website at:

http://www.cleanenergycouncil.org.au/

6.4 Licences

The contractor must be registered as Registered Electrical Contractor to carry out all and all electrical work associated with connecting the PV systems into the building's electrical systems and electricity grid. Submissions

6.5 Technical Data

Prior to purchasing equipment, submit for approval the following technical data:

- Technical description and specifications of each system component.
- Physical layout of photovoltaic arrays showing location of PV modules, mounting equipment, inverters and cable runs.
- Single line schematic(s) showing the configuration of PV strings and inverters and the interconnection with the building electrical systems and connection to Citipower's network.
- Structural calculations for structural loads to AS 1170.
- Shop drawings of switchboards for review.

6.6 Citipower

Submit all design, testing, and commissioning documentation necessary to satisfy the requirement of Citipower for the connection of the PV systems to its network. As a minimum this includes:

- All documentation as required by Citipower including Pre-approval Application for Solar PV Systems and Interconnection Agreement for Solar PV Systems;
- Single line diagram. Specifically show:
  - The main switchboard.
  - Any internal distribution sub-panels to which the inverter will be connected.
  - The location of all fuses and switches between the grid and the inverter.
  - Brief details of all the DC-side connections of the inverter.
- Obtaining a Certificate of Electrical Safety (CES) at the completion of the works. A copy of the CES must be returned to Citipower with the completed Interconnection Agreement for PV Systems.

6.7 Site's Electricity Retailer

The contractor must send a copy of the Electrical Works Request (EWR) and the CES to the site's Electricity Retailer to notify them of the new PV Systems. Citipower will only install co-generation capable metering upon receipt of a service order from the Electricity Retailer.

6.8 PV System Requirement

6.8.1 General

The PV arrays must comprise sufficient number of PV modules whose individual nominal rating under Standard Test Conditions (STC) results in a minimum:

- 37 kilowatt peak array nominal rated capacity for South Melbourne Market Carpark Roofover;

The arrangement of all the components of the photovoltaic system will be arranged so that the PV modules, inverters, data loggers, and any other component, is readily accessible for maintenance and replacement when required.

6.9 Modules

6.9.1 Selection of Modules

No particular brand or model of photovoltaic modules is specified. The contractor will nominate the brand and model of photovoltaic module proposed for this contract, however, high efficiency modules are sought.

6.9.2 Australian Standards

The proposed photovoltaic modules must comply with AS/NZS 5033.

6.9.3 Certification

Crystalline photovoltaic modules (monocrystalline): must be certified with IEC-61215.

All PV modules: must be certified with IEC-61730 and must be listed on listed on the Clean Energy Council approved PV modules list.

6.9.4 Equipment Class

PV modules must be Application Class A (Safety Class II) or better.

6.9.5 Encapsulation

PV modules must be encapsulated in toughened glass.

6.9.6 Protection Rating

PV modules and PV array junction boxes exposed to the environment shall be at least IP65 compliant in accordance with AS 60529 and shall be UV resistant.

6.9.7 Temperature Coefficient

Maximum allowable temperature coefficient of maximum power is -0.5% / °C.

6.9.8 Operating Temperature

Operating module temperature -20°C to +80°C.

6.9.9 Module Efficiency @ Standard Test Conditions

Monocrystalline: > 15%

Multi/poly-crystalline: > 15%

Thin film: not accepted

6.9.10 Mechanical Protection

Hailstone impact testing: Required.

6.9.11 Warranty

20 years – at 80% power output

The contractor is responsible for ensuring the PV modules are installed as per manufacturer's installation, operation or maintenance instructions.

6.10 PV Array Arrangement

Notwithstanding the total PV array power capability for each of the five systems as required under this specification, the number of individual PV modules must be such, and the array so arranged, that the physical arrangement of the array is grouped together symmetrically or geometrically ordered.

Locate the PV arrays within the area indicated in Drawings 31-27445-E006

6.11 PV Mounting Frame

6.11.1 General

Provide proprietary products that are appropriate for this particular installation and the installation environment.

The mounting system shall be mechanically fixed to the exiting roofs. Custom made mounting systems will not be accepted.

6.11.2 Warranty

The mounting systems must have a minimum warranty of 10 years in meeting the requirements of AS1170.2 for normal operating conditions. The contractor must supply a warranty to which the Principal can make a warranty claim.

6.12 Inverter

6.12.1 Selection of Inverter

The selection of the inverter brand and model is not specified, but must be fully compliant with Australian Standards and all other relevant Authorities' requirements including Citipower.

The contractor will nominate the brand and model of inverters proposed for this project. The inverters must be suitable for use with the specified PV system and string configuration taking into account voltage drop and PV module temperature effects.

The total inverters AC nominal power output rating must be equal to or greater than the kilowatt peak rated capacity of the PV modules at Standard Test Conditions (STC).

6.12.2 Australian Standards

The inverter(s) supplied must be certified with AS4777. The inverter(s) must also be listed on the Clean Energy Council approved grid-connect inverter list.

6.12.3 Technical Requirements

The inverter(s) must be also be well ventilated to prevent over-heating and must be capable of autonomously synchronizing with the existing grid voltage.

Waveform: True sine wave.

Waveform quality: to AS 4777.

Voltage regulation: ± 8%.

Max DC voltage: must exceed open-circuit voltage (Voc) of PV strings at 5°C cell temperature.

Maximum power point tracking range: must be between maximum power voltage (Vmp) of PV strings at 25°C and 70°C cell temperature.

Harmonic distortion of output current:< 4%.

Frequency regulation: ± 1%.

Efficiency: ≥ 95% at 10% load.

Protection: Overload, short circuit and transient required.

Automatic no-load shutdown: required.

Display: Output power and grid stability.

6.12.4 Load Balancing

A multiple inverter system must be balanced within 5% across the 3 phases and to the approval of Citipower's requirements.

6.12.5 Warranty

The inverter must have a minimum warranty of 10 years. The contractor must supply a warranty to which the Principal can make a warranty claim to the inverter manufacturer.

6.13 Communication System

6.13.1 General

The communication system must comprise data-logger(s), a display screen and all interfaces including computer system.

Data-logger(s) must be supplied, installed and connected to the solar PV power systems' inverters. The data-logger must be fully compatible with the nominated inverters.

A display screen must be supplied, installed and connected to the data-logger(s) for PV systems performance monitoring and visualisation.

6.13.2 Technical Requirements

The communication system must be capable of recording and displaying the following information:

- Instantaneous electrical energy generation of array (kW)
- Current daily energy generation total (kWh)
- Rolling weekly energy generation profile (chart) including total (kWh)
- Weekly CO_2 avoided (kg)
- Outside air temperature (degrees C)
- Current Solar irradiance (W/m^2)
- Current building total energy demand (kWh)
- Percentage of total building demand supplied by solar energy (%)
- Time period / date for energy generated
- Instantaneous voltage of PV system (V)
- Instantaneous current of PV system (A)

The communication system must be capable of monitoring multiple inverters at once and must be able to record individual inverter performance and operation parameters of the PV, such as DC voltage and current, and AC voltage, current and frequency.

The communication system must provide the following functions:

- Interface the data-logger(s) to the inverters via all communication means including computer system This information is to be made available online.
- Presentation of system data in diagrams and tables
- Ability to customise individual display pages

A LCD display panel must be provided for visualisation.

The data-logger(s) and interface must have the following capabilities:

- Storage data capacity ≥ 1 gigabyte
- Save cycles ≤ 30 minutes

- Connection interfaces: USB-interface, USB socket, 8-pin data cable (RS 485), network plug (RJ 45-sockets) and RS232.

The contractor shall provide training to up to 4 nominated staff, for up to 1 hour, in the use and functionality of the web service product and shall supply all information necessary to maintain the system upon practical completion, including necessary licences, usernames and passwords.

Installation

General: To manufacturers recommendations.

Warranty

Minimum 5 years.

6.14 Moulded Case and Miniature Circuit Breakers

Circuit breaker on Main Switchboard to match existing.

Moulded case breakers: To AS 60947.1, AS 2184 and AS 60947.2.

Miniature circuit breakers: To AS/NZS 60898.1 or AS 3111.

Operation: Independent manual operation including positive ON/OFF indicator.

Trip type:

- Moulded case breakers: Adjustable thermal, fixed magnetic.
- Miniature circuit breakers: Fixed thermal, fixed magnetic.

Current limiting:

- Moulded case breakers: Required.

Isolation facility: Required.

Mounting: Mount circuit breakers so that the ON/OFF and current rating indications are clearly visible with covers or escutcheons in position. Align operating toggles of each circuit breaker in the same plane.

Utilisation category: Moulded case breakers:

- Final subcircuits category: Category A.
- Mains and submains: Category B.

Trip units: Connect interchangeable and integrally fused trip units so that trip units are not live when circuit breaker contacts are open.

6.15 Power Cables

6.15.1 Standard

PVC and XLPE cables: To AS/NZS 5000.1.

6.15.2 Cable

General: Select multi-stranded copper cable generally, except for mineral insulated metal sheathed (MIMS).

Minimum size: 2.5 mm^2 or as shown on the detailed design drawings

Voltage drop: Select final subcircuit cables within the voltage drop parameters dictated by the route length and load.

Fault loop impedance: Select final subcircuit cables selected to satisfy the requirements for automatic disconnection under short circuit and earth fault/touch voltage conditions.

Distribution cables: To AS/NZS 4961.

6.15.3 Conductor Colours

General: For fixed wiring, provide coloured conductor insulation. If this is not practicable, slide at least 150 mm of close fitting coloured sleeving on to each conductor at the termination points.

Active conductors in single phase circuits: Red.

Active conductors in polyphase circuits:

- A phase: Red
- B phase: White
- C phase: Blue

6.15.4 DC Cabling Sizing

DC cables must be sized to maximise system performance. The voltage drop of the photovoltaic system between the photovoltaic array and inverter must be lower than 1% of the total PV array DC voltage.

6.15.5 AC Cabling Sizing

The AC cables must be sized such that the voltage drop between the inverter station and the distribution board is less than 1% of the total PV inverter AC voltage.

6.16 Electrical Installation Requirements

6.16.1 Australian Standards

In addition to the standards listed elsewhere, grid protection devices must be installed in accordance with AS4777.

The photovoltaic system must also be installed in accordance with AS/NZS 5033.

The installation must also comply with AS/NZS 3000 Clause 7.3.8.2.

6.17 DC Cabling Installation

The DC cables shall not be positioned in locations of water drainage or in locations that are likely to prevent the egress of rainwater.

Provide DC isolation within view of the PV array as per AS3000. If the DC isolation equipment is exposed to the environment, provide an IP65 rated enclosure.

The Contractor must allow for the shortest possible DC cable run with facilitated cable installation and cable access without obstructing any walkways, passages or windows.

Provide DC isolation adjacent to the inverter stations.

No DC cabling is to be run live without being terminated at both ends with appropriately rated enclosures.

6.18 AC Cabling Installation

The Contractor must allow for the shortest possible AC cable run with facilitated cable installation and cable access without obstructing any walkways, passages or windows.

6.19 Wiring

Conceal cables and conduits wherever practicable.

6.20 Conduits

Type: Rigid.

Conduit size: ≥ 20 mm.

6.21 Cable Trays

6.21.1 General

Provide new cable tray for DC string cabling on the rear side of PV modules and AC cabling within the plant room area.

Cable trays shall be of perforated metal and fully earthed. All trays shall have a cold rolled galvanised finish and shall be machine press formed, with both edges returned a minimum of 50mm for stiffening. Tray shall be of the following minimum gauges:

Width of Tray	Thickness of Material
75, 100, 150 mm	1.0 mm
225 mm	1.2 mm
300 mm	1.6 mm

The tray width selected with each application shall allow 20% spare space for future cables.

Tray shall be complete with galvanised perforated fishplates, bends and galvanised fixings, all to manufacturer's recommendations.

6.21.2 Installation

Tray shall be secured to the structure and shall be installed with sufficient clearance to permit installation of cable clips and other cable fixings. Supports shall be evenly spaced to ensure that tray is true and

straight. Spacing of supports shall be within the manufacturer's recommendations for the loading concerned and in any case not less than two (2) supports shall be provided per length of tray.

Supports shall be of substantial fabricated hot-dip galvanised steel construction. The complete installation shall be free of any distortion or bowing.

All cable trays and supports where exposed shall be painted to match existing. Colour to be approved by Principal prior to painting.

All dissimilar metals must be separated to prevent galvanic corrosion.

6.22 Colour Code

The following colour code must be used throughout the installation:

Busbars and cabling within switchboards, and all submains cores and polyphase subcircuits must be coloured red, white and blue in accordance with the Electricity Distributor's phase rotation and consistent throughout the site. Wrong phase rotation and consequences shall be rectified at the contractor's expense.

Single-phase subcircuits for lighting and power must be coloured as follows:

- Active conductors Three Phase red, white, blue
- Single Phase red
- Neutral conductors black
- Switchwires white
- Earth conductors green/yellow

6.23 Marking and Labelling

General: Provide labels including control and circuit equipment ratings, functional units, notices for operational and maintenance personnel, incoming and outgoing circuit rating, sizes and origin of supply.

ADDITIONAL MARKINGS: Provide marking as follows in addition to that required by AS 3000.

Labelling of switchboards must be in accordance with AS 4777.1. Signs shall be installed in prominent positions on the Main Switchboard, Inverter Cubicle and all immediate distribution boards. The warning label wording must be identical to the SIGN EXAMPLES given in APPENDIX A of AS 4777.1.

Lettering heights: Include the following requirements:

- Isolating switches: ≥ 5 mm
- Switchboards, main assembly designation: ≥ 25 mm
- Switchboards, outgoing functional units: ≥ 8 mm
- Switchboards, sub assembly designations: ≥ 15 mm
- Warning notices: ≥ 4mm

6.24 Single-Line Diagrams

Provide a single-line diagram of each PV system adjacent to the new solar switchboard and on the inside door of existing distribution broad.

Format: Non-fading print, laminated, at least A3 size, showing the situation as installed.

6.25 Shut-Down Procedure

Provide a step-by-step shut-down procedure immediately adjacent to the Main Switchboard and the new solar switchboard as per Section 4 of AS4509.1.

Specifically reference Main Switchboard and circuit breaker numbers in shut-down procedure.

Format: Non-fading print, laminated, at least A3 size, showing the situation as installed.

6.26 Citipower Requirements

6.26.1 Standards and Guidelines

The technical and safety requirements of the PV Systems need to conform with the current Standards, Codes or Regulations as follows:

- Victorian Electricity Supply Industry (VESI) Service & Installation Rules (SIR);
- Electricity Distribution Code;
- Australian Standards, with particular reference to AS 3000 (Wiring Rules) and AS 4777 (Grid Connection of energy systems via inverters); and
- Electrical Safety Act 1998 and the associated Safety Regulations.

6.26.2 Completion of the Interconnection Agreement for PV Systems

The Interconnection Agreement must be completed and signed by the Principal, the PV System Installer and the Registered Electrical Contractor (REC). Citipower will not process an agreement until such time that it deems it to have been completed to its satisfaction.

The contractor will be able to assist in responding to any of the technical aspects of the interconnection agreement. As per the SIR clause 6.8.1, a schematic diagram of the electrical installation supply arrangements must be submitted to Citipower. Provision for the schematic diagram has been included as part of the interconnection agreement. Sample diagrams can be found on Citipower's website.

6.26.3 Alternative Supply Signage

As part of compliance with standards and guidelines, the following signage must be installed prior to the installation of co-generation capable metering:

- A sign must be placed within the metering enclosure stating "An alternative power supply system is connected to this installation";
- Overhead Supplies – A sign must be placed at the fused overhead connection box (FOLCB) stating "An alternative power supply system is connected to this installation"; and

- Underground Supplies – A sign must be placed at the consumer terminals and incoming service fuse stating “An alternative power supply system is connected to this installation”.

6.26.4 Certificate of Electrical Safety

The REC must obtain a Certificate of Electrical Safety (CES) at the completion of the works. A copy of the CES must be returned to Citipower with the completed Interconnection Agreement for PV Systems.

5. Customer’s Retailer

The Contractor must send a copy of the Electrical Works Request (EWR) and the CES to the Pricinpal’s Electricity Retailer to notify them of the new PV System. Citipower will only install co-generation capable metering upon receipt of a service order from the customer’s Electricity Retailer.

6.27 Testing and Commissioning

6.27.1 Test

Commissioning tests as listed below must be performed in accordance with AS/NZS 5033:2005 Appendix I.

In addition to the commissioning tests outlined below all photovoltaic equipment must be tested that they are operating correctly including the photovoltaic modules, modules strings, inverter(s), meter, data-logger and electrical protection devices.

Open Circuit Voltage Measurements

Short Circuit Current Measurements

Earth Fault Protection Test (if relevant)

Functional In Service Test of Inverter Protection

Remove all loads in the installation (e.g. remove all circuit fuses except for the inverter circuit). Isolate normal supply main switch. The inverter should trip by its own internal protection in less than 2 seconds following disconnection from the distribution system supply. Then close the main switch. The inverter should reconnect after a minimum 1 minute time delay.

Electrical Installations

Inspection: Visually inspect the installation to AS/NZS 3000 before testing. Record on a checklist.

Test and verify the installation to AS/NZS 3000 Section 6 (Mandatory and Optional tests), using the methods outlined in AS/NZS 3017. Record the results of all tests.

Where electrical tests are required and the actual load is not available, provide a dummy load equal to at least 75% of the design load.

6.28 Records

The contractor must prepare a report that includes voltage and temperature measurements, the current and irradiance measurements and the Earth Fault Protection Test (if relevant) and also states the condition of the PV array wiring after the test, including any repairs and corrections carried out as a result of the inspections.

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Paul Morgan Architects

Specification for South Melbourne Market

Hydraulic Services

December 2011

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. General

1.1 Definitions

The following terms shall represent the relevant parties in this specification.

"Superintendent"	-	Acting as the Principal
"Contract Administrator"	-	Client's representative, i.e. Architect or Project Manager
"Engineer"	-	GHD Pty Limited
"Builder"	-	The Company who shall sign the Building Contract for the construction of the Works and who is named in the Articles of Agreement of the Building Contract.
"Contractor"	-	Hydraulics Services Contractor tendering on the contract works as given in this specification
"Contract"	-	Hydraulics Services Contract works being tendered as specified herein.
“Specification”	-	This Hydraulics Services Specification and the associated design drawings and standard drawings.
“Authorities”		Statutory bodies or inspectors of such bodies having jurisdiction over the Works under relevant current regulations and statutes.

1.2 Scope of Work

This scope covers the manufacture, supply, delivery, installation, testing, commissioning, and warranty of the Hydraulics Services as specified herein including but not limited to the following associated with the South Melbourne Market, Melbourne, Victoria. The specification shall be read in conjunction with the architectural, mechanical, structural, survey, civil and electrical services documentation.

This document shall also be read in conjunction with Hydraulic Services Drawings.

This section of the Contract shall include the following hydraulic services as specified herein and as depicted on the relevant drawings:

- Fire services
- Domestic cold and rainwater water service
- Rainwater harvesting tanks, pipes, pumps and accessories as indicated on the drawings.
- Modification/additions to storm water system to suit water harvesting storage tanks
- Painting and labelling of hydraulic services equipment in accordance with Code requirements.
- Three (3) copies of maintenance manuals and shop drawings detailing all “as-installed” hydraulic services and associated controls.

- Defects warranty period as specified herein.
- Provision of all cranage and hoisting for the work of this Contract.
- Co-ordination of all building/roof/wall/floor penetrations and plant, pipe and duct routes with all other trades.
- Demolition, cut and seal as per AS 3500 and removal of redundant piping and hydraulic services.

1.3 Inclusions

Conduct a site survey of the hydraulic layout to confirm the extent of plumbing work. Supply and install hydraulic systems to AS 3500 and the requirements of the relevant authorities. Materials, products and systems used shall be selected from the owners register, where provided, or accredited materials.

Pay all applicable fees and charges in accordance with the controlling authority's current fee scales, including all headworks, contribution and developer levies and charges. Pay all charges for insurance, sales tax and storage.

The contractor shall carry out all incidental works for the hydraulic services, including but not limited to the following:

- All cutting, patching and framing up and making good associated with the hydraulic services.
- Form all penetrations where required.
- Power supply and connection for pumps and hot water units,
- Make good as required where pipework has been removed.

All works shall be carried out in manner that does not disrupt the operation of the adjoining areas of the building. Where access is required to adjoining areas for installation or alteration of service pipes, the contractor shall carry out the works at a time that is agreeable to the occupants.

The Contractor is required during the tendering procedure to note any discrepancy between these documents and the regulations and/or authority requirements and is required to note the matters in his tender submission and provide additional separate pricing accordingly.

These documents reflect the minimum quality acceptable in this contract. Any omissions of detail applicable to the regulations and requirements of authorities having jurisdiction over the works shall be adjusted, amended and incorporated by the contractor without cost variation.

1.4 Cross references

Refer to drawings.

The drawings are diagrammatic only and do not purport to show all structural and architectural details. Final locations of all equipment and pipe works shall be determined in co-ordination with other services, structural and architectural drawings. All locations are to be confirmed prior to installation. Do not scale drawings.

1.5 Standards

All work shall comply with the following Australian Standards.

AS 3500	National Plumbing and Drainage Code
AS 1074	Steel tubes and tubulars for ordinary service.
AS 1345	Identification of the contents of piping, conduits and ducts.
AS 1477	Unplasticised PVC pipes and fittings for pressure applications.
AS 1530	Methods of fire tests on building materials, components and structures.
AS 1572	Copper and copper alloys - seamless tube for engineering purposes.
AS 1628	Water supply - copper alloy gate, globe and non-return valves.
AS 1836	Tubed for pressure purposes - welded steel.
AS1841.1	Portable Fire Extinguishers - General Requirements
AS1841.2	Portable Fire Extinguishers - Water Type
AS1841.3	Portable Fire Extinguishers - Wet Chemical Type
AS1841.4	Portable Fire Extinguishers - Foam Type
AS1841.5	Portable Fire Extinguishers - Powder Type
AS1841.6	Portable Fire Extinguishers - Carbon Dioxide Type
AS1841.7	Portable Fire Extinguishers - Vaporising Liquid Type
AS1850	Portable Fire Extinguishers Classification Rating & Fire Testing
AS 1851.2	Maintenance of fire protection equipment - Hose Reels
AS 1851.4	Maintenance of fire protection equipment - Fire Hydrant Installations
AS 1851.6	Maintenance of fire protection equipment - Management Procedures for Maintaining Features of Air Handling System
AS 2032	Installation of PVC pipe systems.
AS 2129	Flanges for pipes, valves and fittings.
AS 2419	Fire hydrant installations.
AS 2441	Installation of fire hose reels.
AS 2444	Portable fire extinguishers - Selection and location.
AS 2700	Colour Standards for General Purposes
AS 3688	Water supply - copper and copper alloy body compression and capillary fittings and threaded-end connectors.
AS 3795	Copper Alloy Tubes for Plumbing and Drainage Applications
AS 4130	Polyethylene (PE) Pipes for Pressure Applications

Plumbing Regulations 2008

Building Code of Australia

1.6 Authorities

The Hydraulic services installation shall comply with the requirements of the following authorities.

- Relevant Building Surveyor
- MFB
- South East Water
- City of Port Phillip

Any other authority having jurisdiction over all or part of the installation.

1.7 Authority applications, permits and fees

The Hydraulics Contractor is responsible for:

- applying for and obtaining all authority required permits and applications,
- applying for and lodging all authority applications for plumbing works,
- paying all fees and charges in connection with the works including fees applicable to applications and connections to existing authority assets.

1.8 Notice of Inspection

Give sufficient notice so that the Superintendent may attend tests and so that inspection may be made of concealed services prior to covering.

1.9 Demolition

Allow to remove redundant pipework to allow for new installation works. All redundant pipework shall be capped off at the source of supply of termination point of drainage in a secure and tradesman like manner. Demolished material shall be removed from site.

1.10 Site Visit

Visit the site before submitting final tender to assess "on site" conditions. Include for all on site conditions in tender.

1.11 Contractor's Submissions

1.11.1 Samples and product data

Submit samples when requested and manufacturer's product data as follows:

- Certified drawings;
- Performance and rating tables; and
- Recommendations for installation.

1.11.2 Work-as-executed drawings

Submit drawings showing the "as installed" location of hydraulic services and equipment. All "Work as Constructed" drawings shall be carried out on AutoCAD Version 2000 or later in DWG drawing format Prior to Practical Completion submit to the Superintendent for review, three sets of prints of all "As Built" drawings. Upon review provide one CD copy and one set of "As Built" prints within each copy of the Operation & Maintenance Manuals.

. All drawings shall be produced on full sized sheets and to the Contract drawing format.

- stamped “AS CONSTRUCTED”

- fully dimensioned locations of all drain and water services installations in the ground relative to the building grid system and AHD levels
- hydraulic services contractors contact details

1.11.3 Tests records

For each required test and system balance, submit a report or certificate in a form suitable for inclusion in the maintenance manual.

1.11.4 Maintenance manual

Prior to practical completion, submit three copies of operating and maintenance instructions for the equipment installed.

Contents

No.	Section	Sub-section	Requirement
1	Directory	Builder	Provide Contact information.
		Sub-contractors	
		Designers	
		Manufacturers	
2	Warrantees	Schedule	Provide a brief schedule of warrantees identifying warrantor, duration, etc.
		Warrantee Documents	Actual warrantee documents.
3	Certificates	Schedule	Provide a schedule of certificates identifying item and issuing authority.
		Certificate Documents	Actual certificates.
4	Descriptions	Systems	Provide a description of the various systems in the installation
		Installation	Technical description of the systems installed, written to ensure that the principal's staff fully understand the scope and facilities provided. Identify function, normal operating characteristics, and limiting conditions.
5	Equipment, Fixtures and Fittings	Schedule	Provide a schedule of the various components in the installation.

No.	Section	Sub-section	Requirement
		Technical Information	Manufacturers' technical literature for equipment installed, assembled specifically for the project, excluding irrelevant matter. Mark each product data sheet to clearly identify specific products and component parts used in the installation, and data applicable to the installation.
6	Valve Schedule		Refer to Valve Tag clause in this specification.
7	Operation Procedures		Safe starting up, running-in, operating and shutting down procedures for systems installed. Include logical step-by-step sequence of instructions for each procedure. Control sequences and flow diagrams for systems installed. Legend for colour-coded services. Schedules of fixed and variable equipment settings established during commissioning and maintenance.
8	Maintenance	Procedures	Schedule of normal consumable items, local sources of supply, and expected replacement intervals up to a running time of 40,000 hours. Include lubricant and lubrication schedules for equipment. Instructions for use of tools and testing equipment. Emergency procedures, including telephone numbers for emergency services, and procedures for fault finding.
		Schedule	Provide a schedule of maintenance items including frequency.
9	Reports	Meetings with Local Authorities.	Provide copies of all meeting records with local authorities.
		Test Reports	Provide copies of all test report.
		Commissioning Reports	Provide copies of all commissioning reports.
10	Drawings	Shop Drawings	
		As-constructed Drawings	

1.12 Building penetrations

Obtain approval for provision of penetrations including locations of sleeves or core holes in the following building elements:

- Existing structural members including external walls, fire walls, floor slabs and beams; or

- Membrane elements including damp-proof courses, or waterproofing membranes.
- Sleeves: Where pipes pass through building elements provide purpose-made metal or plastic sleeves formed from pipe sections. Prime paint ferrous surfaces. If the building element is acoustic rated, maintain the rating by packing the annular space with suitable insulation.
- Fire-rated elements
- Concrete building elements: Obtain approval for the location of sleeves or core holes.

Where approval is given to penetrate membranes, provide a waterproof seal between the membrane and the pipe.

Where pipes pass through building elements provide purpose-made metal or plastic sleeves formed from pipe sections. Prime paint ferrous surfaces. If the building element is acoustic rated, maintain the rating by packing the annular space with suitable insulation.

Seal penetrations in fire-rated elements using a system conforming to AS 4072.1.

1.13 Painting

Paint new services and equipment where exposed to view, including in plant rooms. Colours to be in accordance with AS 1345.

Proprietary equipment: Provide the manufacturer's standard finish.

Minimum coverage: One priming coat, one intermediate coat and two finishing coats of gloss enamel. Do not spray paint.

1.14 Identification

1.14.1 General

Identify all items of equipment and piping using permanent labelling.

1.14.2 Pipework

Identify throughout its length (including in concealed spaces) to AS 1345.

1.14.3 Equipment labels

Use engraved laminated plastic type, mechanically fixed to the equipment.

1.14.4 Valves

Provide stamped brass or engraved laminated melamine plastic labels identifying the service, fixed to the valve handles.

1.15 Commissioning Tests

Carry out operational tests on all plant and equipment in accordance with the manufacturers recommendations.

On completion of the installation, commission the plant and carry out tests to demonstrate that the systems and components meet the performance requirements. Leave the plant ready for operation. Provide test reports and include a copy in maintenance manuals.

Provide for an inspection service to carry out inspections for all underground drains in accordance with the requirements of the Plumbing Industry Commission requirements.

1.16 Operational Maintenance Period

The maintenance period shall continue for the period of 12 months after the date of Practical Completion.

During liability period attend to emergency calls and rectify all defects.

During the maintenance period maintain a repair log showing details of all breakdown/defects calls.

At the end of the defect liability period, carry out a final check of the installation before handing over the installation and submitting the repair/replacement log.

The cost of maintenance during the Maintenance Period shall be included in the contract amount.

1.17 OH&S Requirements

The contractor shall become familiar with current OH&S requirements with respect to installation of all pipe work, equipment etc

The contractor shall allow to undertake risk and safety assessments during these construction works.

Failure to comply with these requirements shall not constitute a cost variation to the project.

2. Cold Water System

2.1 Scope

Provide a new cold and rain water supply and reticulate to all fixtures and items of equipment noted on the drawings.

2.2 Pipework Materials

2.2.1 Copper pipe

To AS 1432, Type B.

Jointing methods: Use capillary fittings, compression fittings, silver brazed slip joints or screwed joints.

2.2.2 Cross linked Polyethylene (PE-X) pipe

Cross linked Polyethylene pipes with Brass compression fittings (PE-X) shall be manufactured by "Rehau".

Cross linked Polyethylene pipes with Brass compression fittings (PE-X) shall be manufactured in accordance with AS2492 – 1981 and AS2537 - 1982 with pressure ratings of not less than PN20 capable of 60° C at 1.62Mpa and 80° C at 1.33Mpa

All pipes and jointing systems used shall be of the same manufacturer and shall be jointed with brass compression joints system and equipment designed specifically for the purpose supplied by the pipe manufacturer.

2.2.3 Medium Density Polyethylene (pressure) MDPE pipe

Medium density polyethylene shall be manufactured to AS 4131 1993, PE compounds and AS 4130 PE pressure pipe applications.

Minimum class pressure to be used shall be Class 12 however where Class 12 pipes are unavailable then Class 16 pipes and fittings can be used.

2.2.4 Polypropylene Type III (PP-R) pipe

Polypropylene pipes and fittings (PP-R Type III) shall be manufactured in accordance with DIN 8077, DN 8078 and BS 4991 with pressure ratings of not less than PN20 capable of 60° C at 10 Bar and 80° C at 6 Bar

All pipes and jointing systems used shall be of the same manufacturer and shall be jointed with electro fusion system with equipment designed specifically for the purpose supplied by the pipe manufacturer.

2.2.5 Finishes

Finish exposed pipework, including fittings and supports as follows:

- Copper and copper alloy pipework in internal locations such as ablution, toilet and kitchen areas: Chrome plate to AS 1192 service condition 2, bright.

- Metal pipework including protective coatings, except chrome plating: A full gloss solvent borne paint system or equivalent (interior or exterior as appropriate), colour to match adjacent surfaces.
- Pipework in concealed but accessible spaces (including ducts and non-habitable enclosed spaces): Leave unpainted except for required identification marking.
- Exposed fire service pipework painted red.

2.2.6 Valves

Finish valves to match connected pipework.

2.3 Pipework Installation

2.3.1 General

Install pipework in straight lines and uniform grades. Arrange and support the pipework so that it remains free from vibration, whilst permitting thermal movement. Keep the number of joints to a minimum. Prevent direct contact between incompatible metals.

2.3.2 Concealment

Where practicable conceal pipework and fittings requiring maintenance or servicing so that they are accessible within non-habitable enclosed spaces such as roof spaces, subfloor spaces and ducts. Do not run pipelines in masonry cavities. Keep pipelines in subfloor spaces at least 150 mm above ground. Provide not less than 25 mm clearance between adjacent pipelines (measured from the pipe insulation where applicable).

2.3.3 Pipe supports

Materials: The same as the pipe, or galvanized or non-ferrous metals, with bonded PVC or glass fibre woven tape sleeves where needed to separate dissimilar metals.

Steel fasteners: Hot-dip galvanized to AS 1214.

Fixing to masonry: Fix supports to masonry and concrete with galvanized steel or non-ferrous metal bolts or screws with expanding metal masonry or chemical anchors. Do not use explosive powered fixings.

2.3.4 Cleaning

On completion flush the pipeline with water and leave it clean.

2.4 Accessories

2.4.1 General

Provide the accessories and fittings necessary for the proper functioning of the cold water system, including taps, valves, outlets, pressure and temperature control devices, strainers, gauges and pumps.

2.4.2 Cover plates

Where exposed water lines emerge from wall, floor or ceiling finishes, provide cover plates of non-ferrous metal, finished to match the pipe, or of stainless steel.

2.4.3 In ground valves

Valves installed in ground to be provided with a standard cast iron stop tap box, set flush with ground level and a length of suitable pipe extending from the valve cover to the valve. Plastic valve boxes will not be accepted.

Isolating valves and temperature mixing valves inside the building are to be located in walls in accessible locations with suitable sized stainless steel box with hinged access panel. Valves in ceilings will not be accepted.

2.5 Backflow prevention

Provide and install backflow prevention devices in accordance with AS 3500.1 :2003 and as shown on working drawings.

Hose taps located in all areas to be fitted with appropriate backflow prevention device as required by AS 3500.1: 2003.

Hose taps located in areas accessible to the general public are to be provided with approved anti-vandal/tamper proof handles.

2.6 Rainwater Pump Systems

Supply, installation and commission of “All Purpose pumps” or equal approved by Superintendent, pressure boosting and filtration treatment plant for harvested rainwater as shown on the project drawings. This plant designed and manufactured to meet a constant pressure peak duty of 2.0 litres per second at 500kPa.

System to be complete with all components mounted, wired, plumbed utilising ABS pipe-work and housed within a weather proof metal cabinet upon a concrete base.

2.7 Rainwater Reticulation

Extend Rainwater Reticulation from the Filtration Plants and reticulate to fixtures and items of equipment within the building as shown on the project drawings.

3. Stormwater

3.1 General

3.1.1 Scope

Provide alterations and additions to existing or new stormwater system as required to suit the new rainwater harvesting/storage tank.

The general layout of drainage indicated on the drawings is a diagrammatic representation only.

The rainwater tanks shall be provided with overflow devices, pumps, filters, pipes and all accessories as indicated on the hydraulic drawings and required by AS/NZS 3500.

3.1.2 Standard

To AS 3500.3.

3.2 Rainwater Harvesting Tanks

Provide and install a complete rainwater harvesting system including a rainwater harvesting tank, valves, outlets and overflows as detailed in the cold water section of the specification.

The rainwater harvesting tank shall be 1,000,000L steel bolted Tyco Flow Control, or the Tasman Tanks Co or equal approved by Superintendent above ground storage tank, fabricated to Australian Standards and is to incorporate the following:

- inlets into tank,
- tank overflows from tank to drainage system,
- inlet filter and leaf filter basket;
- access pit and level indicator,
- 50mm outlet and isolation valves,
- interconnecting MDPE pipework from tank to the pump,
- pipe support brackets from concrete pad,
- electrical works within the confines of the rainwater treatment plant including an electrical schematic wiring diagram.

3.3 Connection

If connection into an existing drain is required, carry out the excavation necessary to locate and expose the connection point. On completion reinstate the surfaces and elements that have been disturbed such as roads, pavements, kerbs, footpaths and nature strips to the requirements of the Superintendent and the regulatory authority.

4. Fire Service

4.1 General

4.1.1 Scope

Provide a fire hydrant/hose reel service with all necessary piping, branches, fittings, valves, hydrants, hose reels and connections as indicated completely in accordance with the requirements of the relevant authority.

Provide the following fire protection systems.

- New hose reels (including cabinets) refer to drawings for number and locations.
- Fire Hydrants (including cabinets) and accessories,
- Fire Services Pipe works,
- Valves and accessories
- Updated block plan.

4.2 Standard

AS 1221	Fire hose reels
AS 1530	Methods for fire tests on building materials, components and structures
	Part 4 – Fire-resistance tests of elements of construction
AS 1851	Maintenance of fire protection equipment
	Part 1 – Portable fire extinguishers
	Part 2 – Fire hose reels
	Part 4 – Fire hydrant installations
AS 2419	Installation of fire hydrants
AS 2441	Installation of fire hose reels
AS 2792	Fire hose – Delivery lay flat

4.3 Materials And Workmanship

4.3.1 General

Fire hydrants: To AS 2419.

Layflat delivery hose for connection to fire hydrants: To AS 2792.

MARKING: Fire layflat delivery hose, shall bear the Australian Standards Association ‘Standards Mark’ symbol under the Australian Standards Certification Trade Mark Scheme.

4.3.2 Fire Hydrant – Fire Protection

INSTALLATION: to AS 2419

FIRE HOSE: to AS 2792

HYDRANT TYPE: Dual 63 mm millcocks with fittings suitable for the fire brigade.

4.3.3 Fire Hose Reel – Fire Protection

STANDARD: to AS 1221

INSTALLATION: to AS 2441

REQUIREMENT: fitted with 36 m of 19 mm hose, with Orion spray nozzle

4.3.4 Inspections – Fire Hydrant

NOTICE: Arrange for the following inspections, tests, and the like as listed below and give sufficient notice so that the Superintendent may witness them.

Authorities: Inspections and tests required by regulations and other nominated authorities prior to their approval of the installation or its stages.

Work in Progress:

- Installation and testing of buried pipework prior to enclosing
- Pressure tests on all hidden piping systems.

All performance and compliance tests.

4.4 Testing

On completion of the fire services installation, engage an approved independent certified fire tester to carry out test and compliance report in accordance with the requirements of AS 2419 and the local fire authority.

Pay all fees associated with tests and compliance testing and report carried out by the independent fire tester.

Any compliance report subject to conditions shall not be accepted and additional testing shall be carried out until full compliance with AS 2419 is met.

4.4.1 Factory Tests – Fire Hydrant

REQUIREMENT: to AS 2419

4.4.2 Commissioning Tests – Fire Hydrant

SYSTEM PROVING TESTS: Perform the tests necessary to certify completion as specified in AS 1221 and AS 2441.

HYDROSTATIC TEST: Test pipework to AS 2419. Maintain the test pressure beyond the specified period if necessary to complete the inspection of pipework under test.

WATER QUALITY TESTS: Demonstrate that the system water is clean and free from foreign matter, including sand, sediments, and other impurities, by the following tests:

- Discharge test:water discharged from all points

Test failure: A test has failed if foreign matter is observed in quantities considered by the Superintendent to be likely to impair the functioning of the system.

Remedial action:

- If either test fails, drain the system, open and clean the system, and recharge the system with water;

4.5 Finishes

4.5.1 Finishes – Fire Hydrant

CORROSION PROTECTION: Provide corrosion protection and finish paint all pipework to the Fire Hydrant system by means suitable to the location and environment. Manufacturers' standard finishes shall be not inferior to those specified in FINISHES Section for pipework, as applicable.

PIPE IDENTIFICATION: To AS 1345, by means of the 'basic identification colours' applied as full length painting.

5. Extinguishers

5.1 General

This section describes the requirements for hand held fire extinguishers.

5.2 Components

5.2.1 Authorised products

General

Provide equipment listed in the SSL Register of Accredited Products - Fire Protection Equipment.

5.2.2 Extinguishers

Standards

General: Provide portable fire extinguishers and location signs as follows:

General requirements: To AS/NZS 1841.1.

Water: To AS/NZS 1841.2.

Wet chemical: To AS/NZS 1841.3.

Foam: To AS/NZS 1841.4.

Powder: To AS/NZS 1841.5.

Carbon dioxide: To AS/NZS 1841.6.

5.3 Completion

5.3.1 Maintenance

Fire extinguishers

Standard: To AS 1851.1.

GHD

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